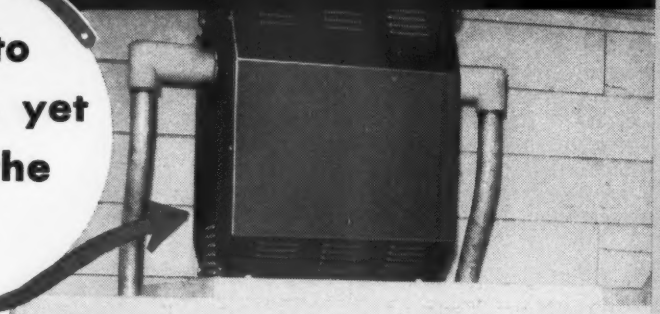
Electrical Contracting

A Compact Power Supply Right Where It's Wanted

Close to the load, yet out of the way



- ✓ NO OIL
- ✓ TOTALLY METAL ENCLOSED
- ✓ NO FIREPROOF VAULTS
- ✓ REMOTE MOUNTING UNNECESSARY
- ✓ NO LONG RUNS OF HEAVY COPPER

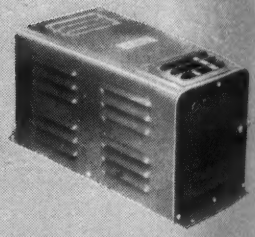
TUCKED AWAY UNDER THE EAVES at Kaiser Cargo, Inc., Shipyard No. 4, this 25-kva G-E dry-type transformer takes power from a 440-volt circuit and steps it down to operate 110- or 220-volt electric hand tools and lighting circuits, close by. The inherent safety that permitted it to be placed close to the load eliminated the need of long runs of heavy, expensive copper.

Installed right at the load, Type D transformers provide your equipment with the right voltage for its most economical operation. They are being used, profitably, from coast-to-coast in industrial plants to insulate one circuit from another and to boost or step down voltage for the most efficient operation of such equipment as motors, machine tools, welding apparatus, heat-treating furnaces, and high-current testing devices.

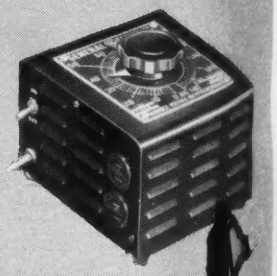
Stay cool; save space—Type D transformers are cooled by natural-draft ventilation. Their unique, drip-proof case, which incorporates a slanted-louver construction, aids the flow of ventilation air through the transformer coils. They can be placed against a wall or close to other units, with little or no effect on the temperature rise of the transformer. Because of this fact, considerable space can often be saved, especially when a number of these transformers are to be banked.

Easy to install; maintenance negligible—As these transformers are small, compact, and lightweight, they are easy to install on the floor, on the wall, or anywhere you wish. Either conduit or open wiring can be used. The ease of disassembly and reassembly of case parts permits quick inspection and cleaning, when necessary. But operating records show that little or no maintenance is required. Type D transformers are available in ratings up to 100 kva, 600 volts. For further information, ask for Bulletin GEA-897. *General Electric Company, Schenectady 5, N. Y.*

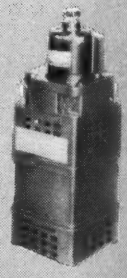
OTHER G-E AIDS TO BETTER VOLTAGE



VOLTAGE STABILIZER—Automatically provides a constant 115-volt supply to a given load, on circuits varying from 95 to 130 volts. Ratings from 50 to 5000 va. Ideal for precision laboratory or manufacturing processes, or built into such equipment as radio transmitters.



VARIABLE-VOLTAGE [illegible]O-TRANSFORMER—Provides smooth, adjustable control of voltage, current, light, temperature, power, and speed at a turn of the dial. Ratings from 243 to 810 va. Ideal for use in factories, laboratories, and assembled with other equipment.



AIR-COOLED REGULATORS—Automatic type: for secondary circuits (10% regulation, raise and lower). Remote-motor or hand operated: for laboratory or testing (100% raise and lower). Ratings up to 12 kva, 600 volts.

THE RIGHT VOLTAGE AT THE RIGHT PLACE DOES THE JOB **BETTER**

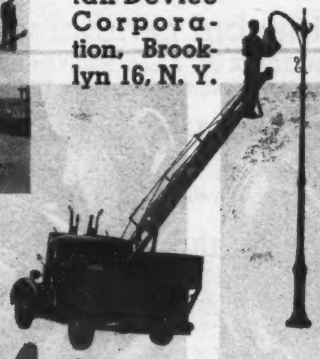
GENERAL ELECTRIC

403-71-5205, 5400

HOW *crows'nest* REPLACES MILES OF MAKESHIFTS!

UP-IN-THE-AIR-JOBS DONE *SPEEDILY* AND SAFELY FROM THE PLATFORM OF THIS AERIAL LADDER

Up-in-the-air-work in industries of every sort has found new safety, new speed, new flexibility due to the Murray Crows'nest aerial ladder. It has long been the standard maintenance ladder of the electrical industry. It may be mounted on a variety of bases, from motor trucks to caster trailers, live skids, wagon trailers, etc. — whichever best suits individual plant conditions. It is particularly efficient for servicing — without interrupting production — fluorescents and other luminaires, as well as unit heaters, sprinkler heads, painting. Many are being used for servicing and inspecting planes at air fields and modification centers. Metropolitan Device Corporation, Brooklyn 16, N. Y.



Murray

DEMOUNTABLE *crows'nest*

Metropolitan Device Corp.
Brooklyn 16, N. Y

Send data (without obligation) on Murray Crows'nest suitable for our requirements.
Ladder must reach feet high, and extend feet side-ways. Aisle width is feet.

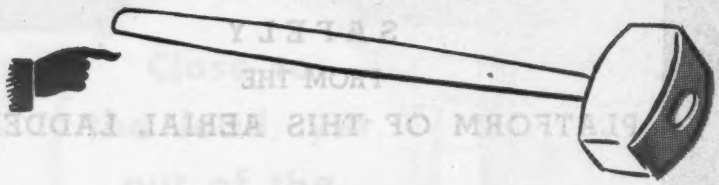
Name and Title_____

Company_____

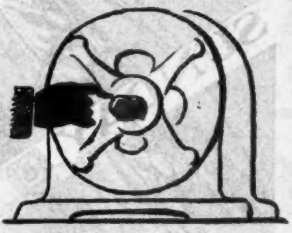
Address_____

ELECTRICAL CONTRACTING. Published monthly, price 25 cents a copy. Vol. 43, No. 11. Allow at least ten days for change of address. RETURN POSTAGE GUARANTEED. Publication Office, 99-129 N. Broadway, Albany, N. Y. All communications about subscriptions should be addressed to the Director of Circulation, Electrical Contracting, 330 West 42nd St., New York 18, N. Y. Subscription Rates——U. S. A. and Latin American Republics, $2.00 a year, $3.00 for two years, $4.00 for three years. Canada $2.50 a year, $4.00 for two years, $5.00 for three years. Great Britain and British Possessions, 18 shillings for one year, 34 shillings for three years. All other countries $3.00 a year, $5.00 for three years. Entered as second-class matter August 29, 1936, at Post Office, Albany, N. Y., under the Act of March 3, 1879. Printed in U. S. Copyright 1944 by McGraw-Hill Publishing Company. Cable address: "McGraw-Hill, New York." Member A. B. P. Member A. B. C.

It doesn't take this



to get

this  off this 

Allis-Chalmers' new "Magic-Grip" — *fastest mounting and demounting sheave on the market* — is removed from shaft in just 3 easy steps . . . saving you time, trouble, money.

1 **Remove three capscrews** from bushing collar. A handy wrench — supplied with each sheave — is the only tool needed to remove Allis-Chalmers' new "Magic-Grip" from motor or machine shaft quickly and easily.

2 **Insert two capscrews** in tapped holes. As screws are turned, they become levers . . . automatically breaking tight grip of tapered split bushing on sheave and shaft. Entire unit is then ready for removal.

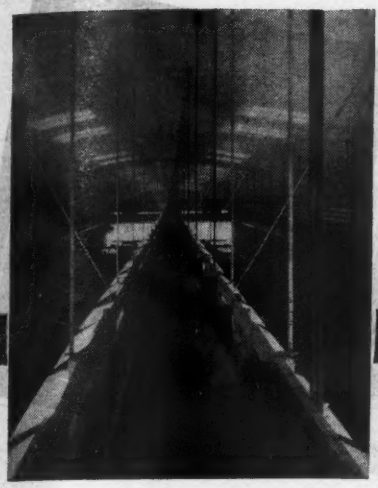
3 **Remove sheave from shaft.** Requires no mallet, no prying, no bulging muscles. You just slide the sheave off . . . smoothly, quickly. *It costs nothing extra!* Send for B6310. Allis-Chalmers, Milwaukee 1, Wis.

A 1758

Allis-Chalmers Texrope

"MAGIC-GRIP"

SHEAVES



OUR COVER—Indirect lighting at Budd Field plant marks a new approach to industrial lighting application. Story on page 43.

Electrical Contracting

Contents for NOVEMBER, 1944

Departments

W. T. Stuart.....Editor
Alice McMullen.....Associate Editor
August Eckel....Middle West Editor
R. E. Miller.....Industrial Editor
W. A. Cyr.....Pacific Coast Editor
H. W. Young.....Southwest Editor
Harry Phillips.....Art Editor
W. K. Beard, Jr.....Publisher
M. S. MacNaught..Manager

DISTRICT MANAGERS

S. A. Jones.....New York
F. J. Seiler.....Cleveland
W. B. Heaps.....Chicago
A. B. Conklin, Jr.....On leave U. S. Army

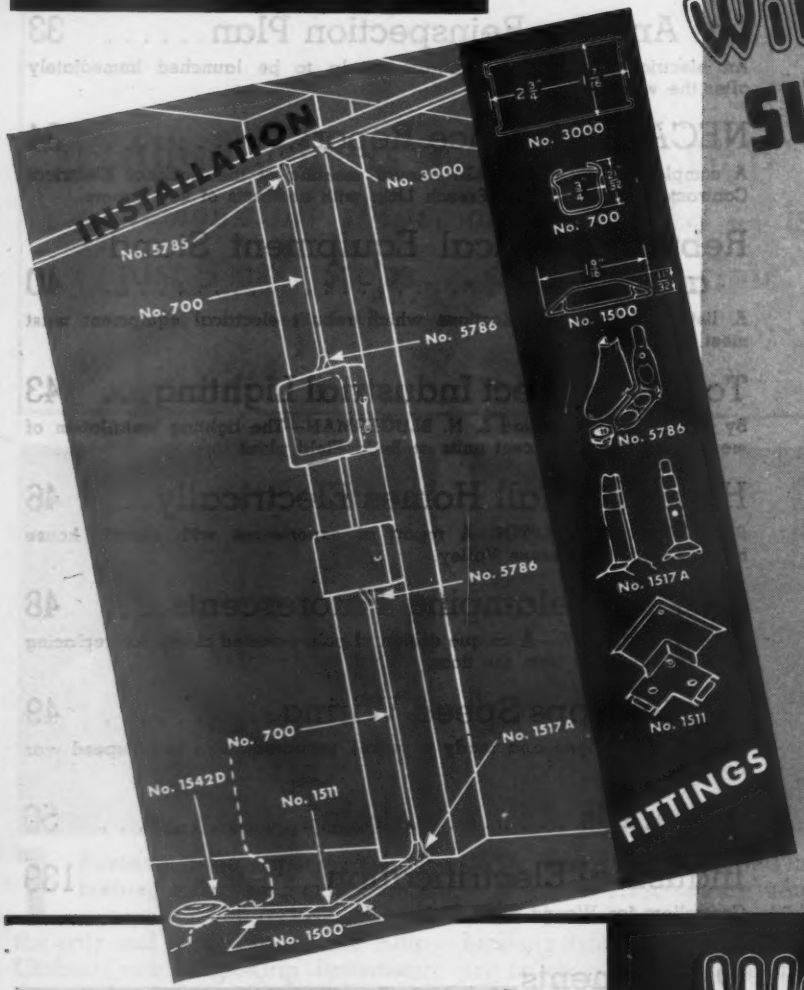
McGRAW-HILL PUBLISHING COMPANY, INC. JAMES H. McGRAW, Founder and Honorary Chairman; JAMES H. McGRAW, Jr., President; HOWARD EHRLICH, Executive Vice-President for Business Operations; JOHN ABBINK, Executive Vice-President for Editorial Operations; CURTIS W. McGRAW, Vice-President and Treasurer; JOSEPH A. GERARDI, Secretary; J. E. BLACKBURN, Jr., Director of Circulation. Publication Office, 99-129 North Broadway, Albany, N. Y. Editorial and Executive Offices, 330 W. 42nd St., New York 18, N. Y. *Branch Offices:* 520 North Michigan Ave., Chicago 11; 68 Post St., San Francisco 4; Aldwych House, Aldwych, London, W. C. 2; Washington; Philadelphia 2; Cleveland 15; Detroit 26; St. Louis 8; Boston 16; Atlanta, 3; Los Angeles 13; Pittsburgh 22. Member A.B.C. Member A.S.P.

A practical technical and management journal for electrical contractors, industrial electricians, inspection engineers and motor shops, covering engineering, installation, repairing, maintenance and management of electrical construction and maintenance.

the problem

Simplified wiring of small motor-driven machines

the answer



WIREMOLD SURFACE METAL RACEWAYS

● Shown in the photograph above and the diagram at the left is the wiring layout for a group of small presses. This clean, efficient, safe installation required no costly channeling of floors and eliminated drop connections from overhead wiring. It demonstrates how Wiremold Raceways interconnect one with another to meet widely varying installation needs. Here No. 3000 is used to carry sub-feeders, with take-off at each station through No. 700 to motor controls, and to No. 1500 Pancake across floor, completing connection to the machines.

Strong and safe, Wiremold Raceways are easily and quickly installed and are available, with their fittings, in a range of sizes and capacities to meet the installation needs of every type of building. Engineering data sheets covering the above installation and many others, also new Industrial Wiring Bulletins are available on request.

WIREMOLD CAN HELP YOU PRODUCE FOR WAR . . . WHILE YOU PLAN FOR PEACE!

KNOW YOUR

WIREMOLD

AND YOU KNOW THE ANSWERS

NEMA

THE WIREMOLD COMPANY HARTFORD 10, CONN.

DOSE OF SALT

Encrusted with chemical salts, this Tri-Clad motor continues to drive a pump without breakdown of its insulation. In almost every industrial plant, motors are called upon to keep going under conditions which try their endurance to the limit. It may be in a plating room, or on an exhaust fan, or in a wet sub-cellar, or — as in this case — in connection with chemical processing. In emergencies, open motors may face conditions for which good engineering practice would require totally enclosed construction — conditions which tend to corrode the frame and attack the insulation. Endurance of Tri-Clad motors under such conditions results from tests like the one described below.

Salt-spray test of TRI CLAD motors gives assurance of long life in severe service

REG. U.S. PAT. OFF.

In this accelerated life test to determine the ultimate endurance of their insulation, the motors are operated to failure under one of the worst possible combinations of conditions. They are continually exposed to a 2% salt-water spray, while operating on a duty cycle of 3 minutes on and 37 minutes off. (These repeated voltage surges impose greater stress on the insulation than would continuous operation.) Tests are run on all new insulations developed, and as a production check on motors taken at random off the assembly lines. Because of their endurance under this severe test, among others, Formex* wire and Glyptal* bonding material were chosen for Tri-Clad insulation.

*Reg. U.S. Pat. Off.

Left: Conical hoods cover the tanks in which these salt-spray tests are conducted.

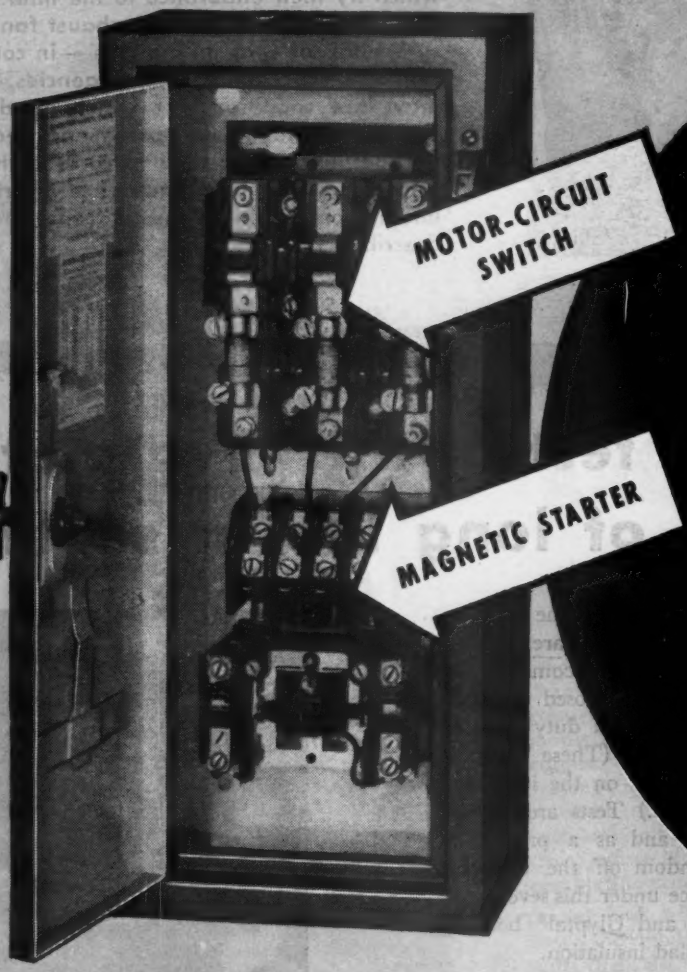
GENERAL ELECTRIC

Every week 192,000 G-E employees purchase more than a million dollars' worth of War Bonds.

MOTOR STARTERS

EVERY TYPE,

DEPENDABLE . . . ATTRACTIVE IN APPEARANCE



For full-voltage starting of squirrel-cage a-c motors

BOTH IN ONE UNIT

YOU SAVE 6 WAYS WITH COMBINATION STARTERS

1. Save Ordering Time—Instead of buying two separately mounted devices, you buy one factory co-ordinated unit that controls and protects your motor.

2. Save Installation Time—Users report a 50 per-cent reduction in mounting time, a 40 per-cent reduction in wiring time, as compared with the installation of two separate devices. You connect only 9 terminals—not 15.

3. Save Man Power—By eliminating one complete mounting job on every installation, you save valuable man power.

4. Save Money—Cost slightly more than two separately mounted devices, but the difference is more than made up by the savings in wire, conduit, fittings, and installation-labor costs.

5. Save Wall Space—Take up less space than separately mounted devices. You can mount combination starters in small, unused spaces near the operators.

6. Save Critical Materials—Combination starters have less copper wire, steel conduit, and fittings than separately mounted devices

—and they save your motors, too. The fuses, or the breaker, are co-ordinated with the thermal overload relays to give complete motor protection under short-circuit or overload conditions.

EVERY KIND, FOR EVERY MACHINE APPLICATION

DESIGNED TO BLEND WITH MODERN MACHINES

Magnetic Full-voltage Starter—Designed to provide long life, ease of installation, readily accessible parts for quick inspection, and the dependability requisite to modern industrial needs.

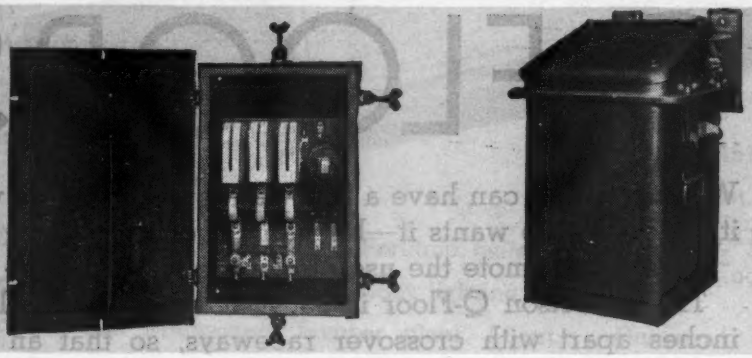
Magnetic Full-voltage Starter—Showing Selector switch mounted in the cover of a general-purpose case.

A-c Magnetic Starter with Watertight Case—Wall-mounted, overload-relay reset button in cover, and push button can be added.

Starter with Dust-tight Case—Fabricated, case of cold-rolled sheet steel—wall-mounted—overload-relay reset button in cover.

Oil-Immersed General-purpose Starter—Suitable for use in corrosive atmospheres found in such places as chemical plants and oil refineries, or for outdoor use.

Starter for Hazardous Locations—Will withstand internal explosion—high tensile cast iron will meet hydrostatic pressure test—overload-relay reset button in cover.



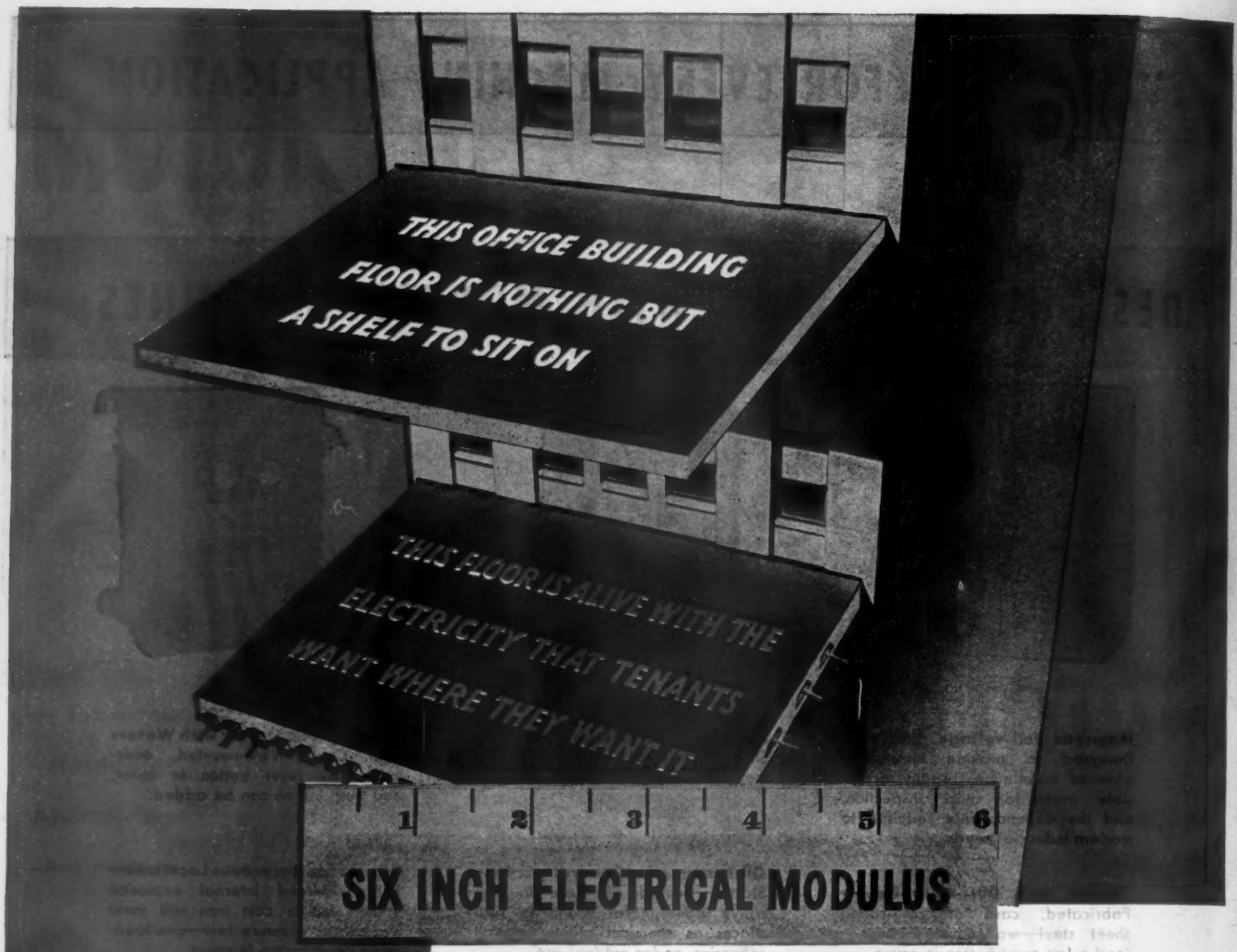
NAME YOUR APPLICATION

G-E starters come in a variety of enclosures to meet any operating condition, and are available for motors from 1 to 1000 horsepower. Write today for further information about these starters—our engineers will be glad to help you select the correct type for your needs. *General Electric Company, Schenectady 5, N. Y.*

INDUSTRIAL CONTROL

GENERAL ELECTRIC

BUY WAR BONDS



You can obtain *Electrical Fittings* for use with Robertson Q-Floors through your General Electric Construction materials distributor. For information on how these fittings can be used to obtain adequate up-to-date electrical wiring, see the nearest G. E. Merchandise Distributor.

Q-FLOORS

When a tenant can have a new outlet whenever he wants it, wherever he wants it—he wants it often.

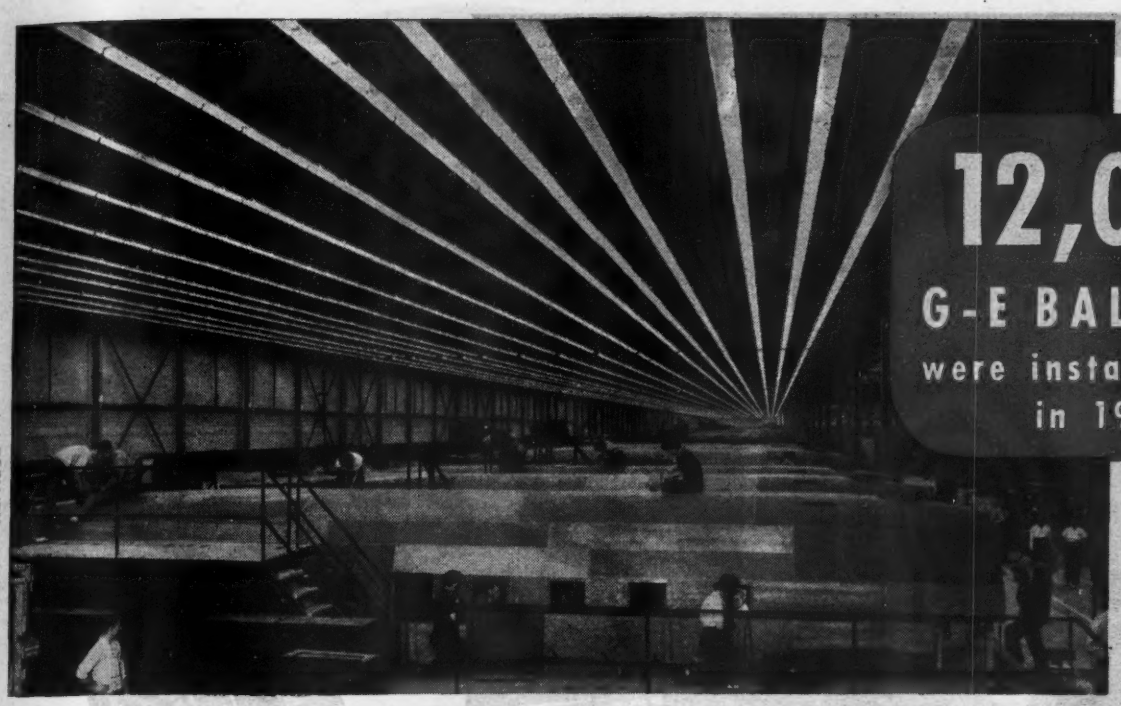
Q-Floors promote the use of electricity.

The Robertson Q-Floor is constructed of steel cells six inches apart with crossover raceways, so that an electrical outlet can be installed on any six-inch area. This convenience is something building owners brag about. Instead of discouraging tenants from asking for electrical changes, owners sell the electrical availability of their Q-Floors. Tenants need only call an electrician to install a new outlet and they will have their equipment exactly where they want it. The six inch electrical modulus of Q-Floors throws the emphasis of a building's service upon *electrical availability.*

H. H. ROBERTSON COMPANY

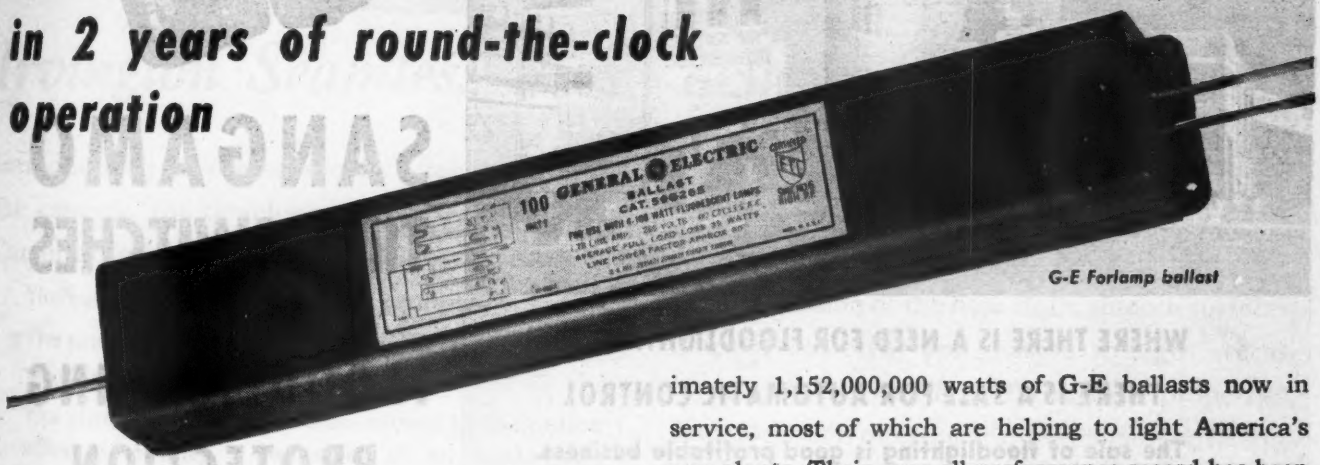
2400 Farmers Bank Building
Pittsburgh, Pennsylvania

Offices in 45 Principal Cities
World-Wide Building Service



12,000 G-E BALLASTS were installed here in 1942

ONLY 6 have failed electrically in 2 years of round-the-clock operation



G-E Forlamp ballast

THREE years ago, 12,696 G-E Forlamp ballasts were ordered for the large fluorescent lighting installation at this Midwestern bomber plant. About 12,000 units were actually installed, the remainder to be used as spares. The lighting was turned on in October, 1942.

To date, only six ballasts have had to be replaced on account of electrical failures. Because of this record, the maintenance engineer plans to list as surplus most of the remaining ballasts he has in stock.

This experience is not unique. There are approximately 1,152,000,000 watts of G-E ballasts now in service, most of which are helping to light America's war plants. Their over-all performance record has been better than 99.5 per cent perfect.

Our newly revised catalog (GEA-3293F) contains complete information on our comprehensive line of single-lamp, Tulamp, three-lamp, and Forlamp ballasts, including data on the new, two-way-lead design that permits the leads to be brought out either the ends or the bottom of the ballast case. Ask your G-E representative for a copy, or write to General Electric Company, Schenectady 5, N. Y.

Buy all the BONDS you can — and keep all you buy

GENERAL ELECTRIC

WHILE THERE'S DARKNESS . . . . .

THERE IS *Light!*

SANGAMO TIME SWITCHES FOR FLOODLIGHTING PROTECTION

★

• There are types to meet every protective lighting control need. The complete line includes Astronomic Dial, Synchronous Carry-Over, and Outdoor Time Switches. Form VSW2 Astronomic Dial Time Switch is shown above. Current interruptions up to 10 hours will not stop it nor affect its "on" and "off" settings.

★

ARMY E NAVY

WHERE THERE IS A NEED FOR FLOODLIGHTING . . .

THERE IS A SALE FOR AUTOMATIC CONTROL

The sale of floodlighting is good profitable business. BUT there is another profit you can add to each floodlighting sale . . . it is Automatic Control of Floodlighting with SANGAMO TIME SWITCHES.

Buyers of floodlighting listen intently when you bring up the point that floodlighting must be safeguarded—that the "on" and "off" times must be exact—that when they depend on the human element for control they are leaving themselves wide open to error in timing. These men—your customers—are eager to protect their floodlighting investment and have light all the way while there is darkness.

Our catalog tells about installation—range of application—construction—and complete range of types of SANGAMO TIME SWITCHES.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

Irvington Seamless Bias Varnished Cambric Tape

Introduced by Irvington shortly after the turn of the century, the development of Seamless Bias Cambric Tape made possible—

- **... The successful use of bias tape on taping machines**
- **... The production of tight, smooth uniformly protected windings of any contour**
- **... The elimination of air pockets caused by the coning effect of taping a conductor at an angle with straight cut tape**
- **... The saving of time and material by ending cutting waste.**

Improvements in manufacturing technique and varnish formulation have earned continuing rec ognition of Irvington Seamless Bias Varnished Cambric Tape as a leader in its field. Laboratory and field performances repeatedly attest to its uniformity, workability, stable low power factor and resistance to deterioration. Through studied, careful preparation of the base cloth, smooth surfaces, unusual flexibility and tearing strength are assured, without sacrifice of electrical properties. And, although offering ample elongation, Irvington Seamless Bias Varnished Cambric Tape, after stretching, retains 70 percent, or more, of its original high dielectric strength, regardless of thickness, finish, or color.

For detailed technical data, write for catalog "Irvington Varnished Insulation" and supplementary information. Address Dept. 96.

IRVINGTON PRODUCTS: Varnished Fabrics and Papers; Slot Insulation; Flexible Varnished Tubings and Saturated Sleevings; Extruded Plastic Tubings; Harvel and Irvington Insulating Varnishes; Cardolite Resins; Fibron Plastic Tape.

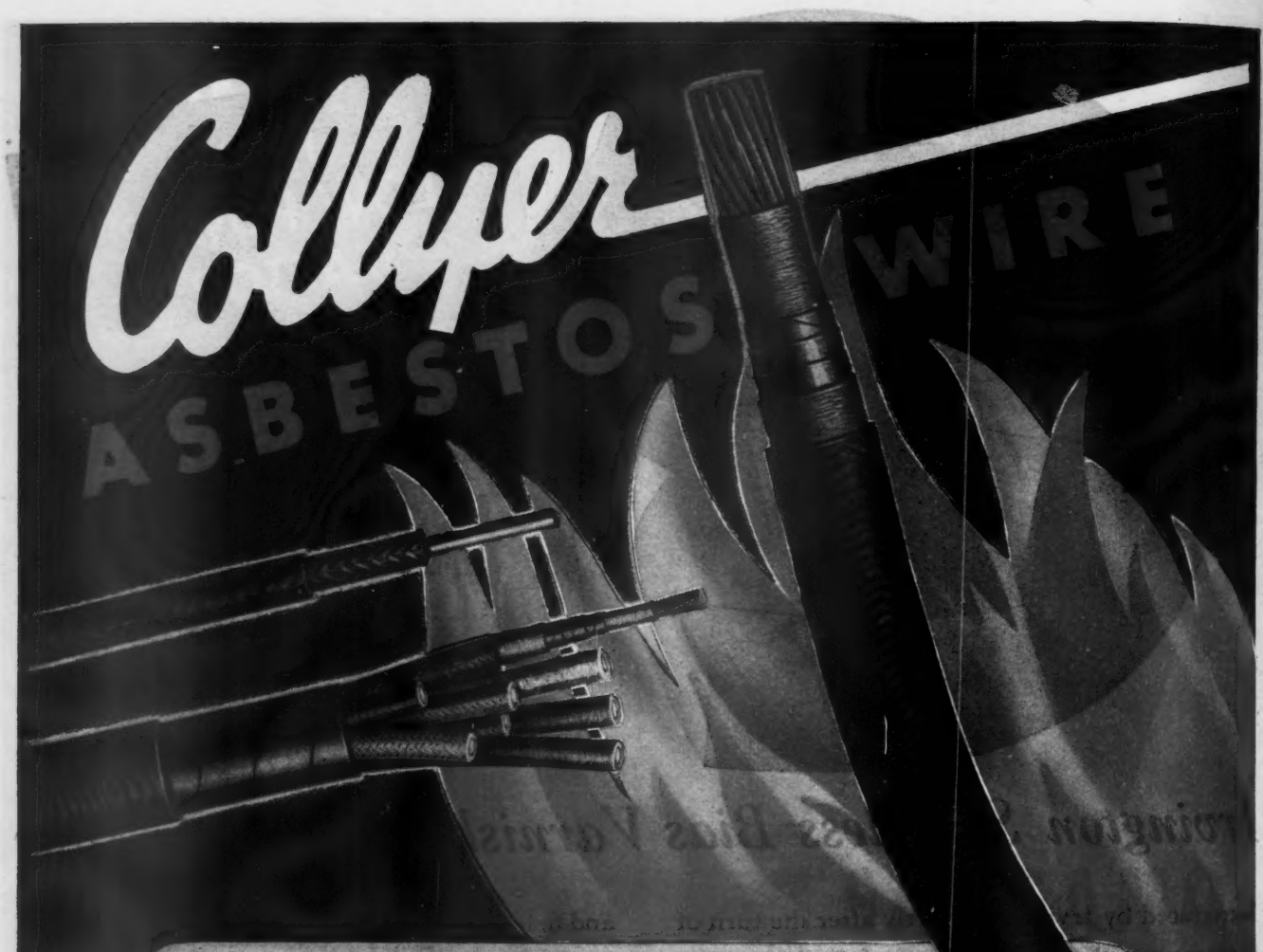
Irvington Varnish & Insulator Company

Irvington 11, New Jersey, U. S. A.

Plants at Irvington, New Jersey, and Hamilton, Ontario, Canada

Collyer

ASBESTOS WIRE



Where it's HOT — or where corrosive vapors cut down the life span of ordinary insulation, Collyer Asbestos Wire eliminates annoying failures of electrical circuits. This wire, covered by a seamless coat of asbestos felt, impregnated with a special insulating and moisture-resisting compound, withstands conditions too severe for other types of insulation. Collyer Asbestos Wire is available . . NOW . . in many constructions for countless uses.

FOR THAT HOT PLACE

America's war needs still demand most of our production of other Collyer Wire but the day draws nearer when Collyer's complete line of high quality wiring will again be available.

For further information about Asbestos or other types of Collyer Wire, contact your local Collyer representative or write us direct.

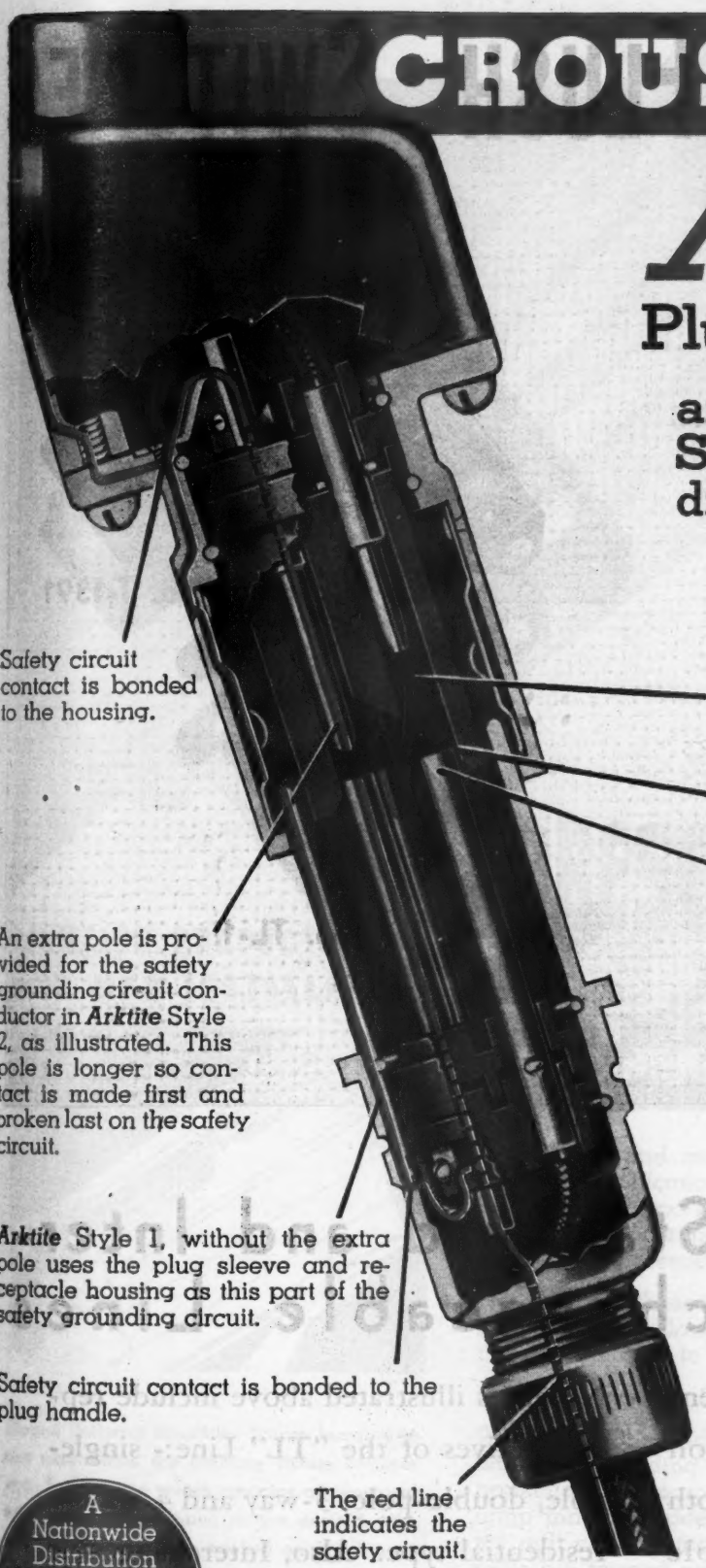
COLLYER INSULATED WIRE CO., 247 ROOSEVELT AVE., PAWTUCKET, R. I.

CROUSE-HINDS

Arktite

Plugs and Receptacles

are circuit breaking and SAFE without additional disconnect equipment.



Safety circuit contact is bonded to the housing.

The arc formed by pulling the plug is instantly snuffed in the confined insulated arcing chamber.

Each plug contact fits closely the opening of its individual arcing chamber.

The arc is broken while the plug contact is still a considerable distance inside of the arcing chamber. There is no danger of the arc traveling over to the other side of the circuit or to the housing.

An extra pole is provided for the safety grounding circuit conductor in ***Arktite*** Style 2, as illustrated. This pole is longer so contact is made first and broken last on the safety circuit.

Arktite Style 1, without the extra pole uses the plug sleeve and receptacle housing as this part of the safety grounding circuit.

Safety circuit contact is bonded to the plug handle.

The red line indicates the safety circuit.

CROUSE-HINDS offers the only complete line of circuit breaking plugs and receptacles—20 Amp. to 400 Amp., 250 volt D.C., 600 volt A.C.

Arktite plugs and receptacles are listed in Condulet Catalog No. 2500, Section 40. Explosion-proof Arktite plugs and receptacles are listed in Section 85, "Condulets for Hazardous Locations."

A Nationwide Distribution Through Electrical Wholesalers

CROUSE-HINDS COMPANY

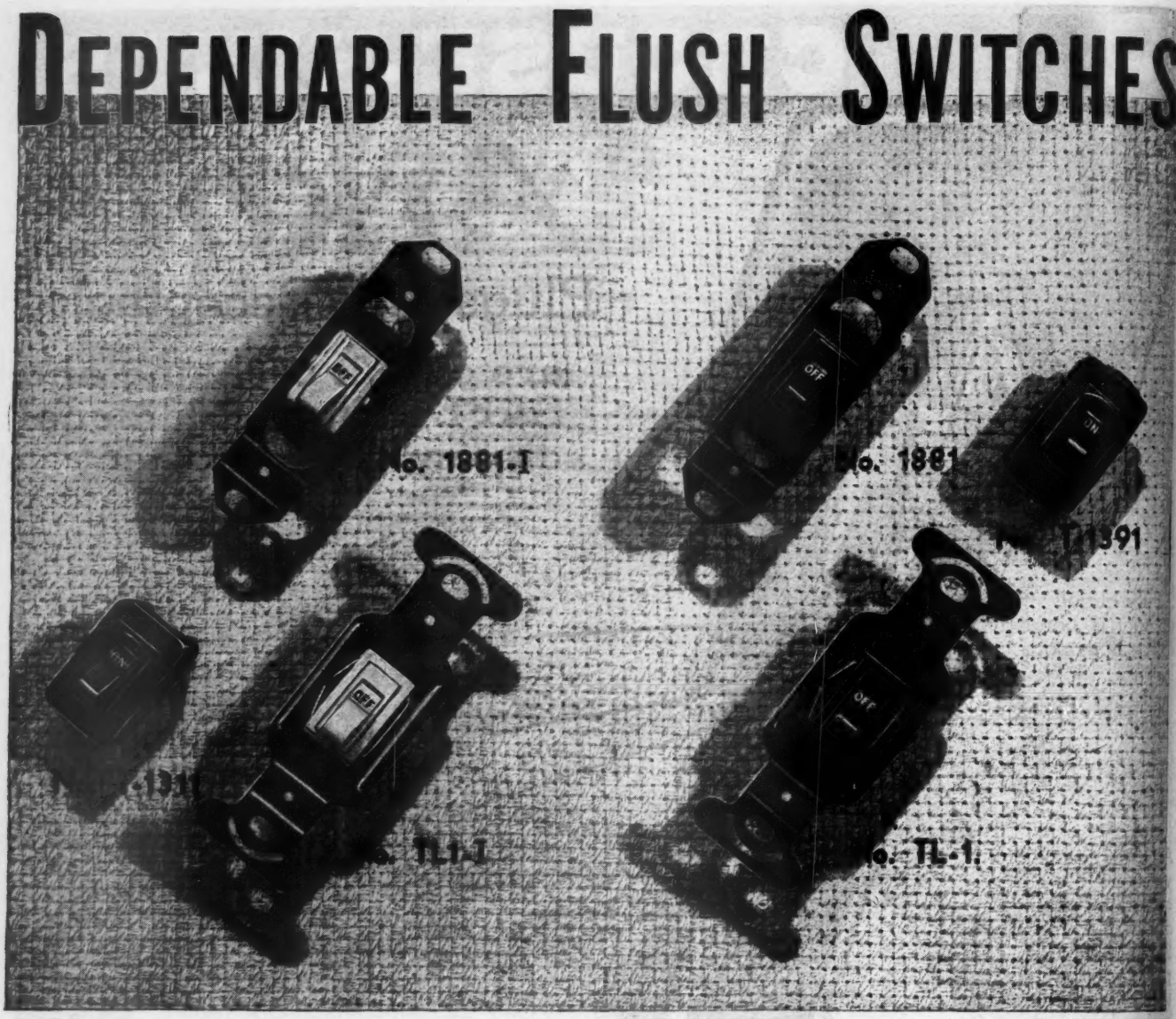
SYRACUSE 1, N. Y., U.S.A.

Offices: Birmingham Boston Chicago Cincinnati Cleveland—Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Milwaukee Minneapolis New York Philadelphia Pittsburgh San Francisco—Seattle St. Louis—Washington. *Resident Product Engineers:* Albany Atlanta Charlotte New Orleans

CROUSE-HINDS COMPANY OF CANADA, LTD., *Main Office and Plant:* TORONTO, ONT.

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS

DEPENDABLE FLUSH SWITCHES



H & H Standard and Interchangeable Lines

These popular numbers provide essential types for "coming through" on residential wiring requirements. Both the Standard and Interchangeable Line switches have the same degree of dependable design and mechanism —the famous H & H "degree".

Numbers illustrated above include representatives of the "TL" Line:- single-pole, double-pole, 3-way and 4-way—residential type. Also, Interchangeable Switches to go with receptacles or other units in a single gang.

HART & HEGEMAN DIVISION

DISTRIBUTED THROUGH ELECTRICAL WHOLESALERS

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY, HARTFORD, CONN. U.S.A.

LIGHTING PRODUCTS INC.
ONE MAN INSTALLATION

Hinged Reflector simplifies fixture hanging to one man where the ordinary fixture requires two. The housing which contains all electrical equipment, is first hung in the desired position. Reflector is then hooked on housing as shown in above illustration. This relieves person of holding up the entire weight of Metal Reflector. When units are mounted in continuous runs any unit Reflector may be swung independently of the others.

With Labor Saving Installation and Maintenance Features . . .

Engineered and manufactured to more than meet the most rigid lighting specifications, the new all-metal-all-feature No. 125-A with conventional type ballasts and the No. 130-A furnished with instant start ballasts, combine design features not to be found in any other industrial fluorescent fixture.

Not only are these units outstanding in utility design—but are constructed to give longer life and to deliver more high intensity effective illumination to the lighting plane.

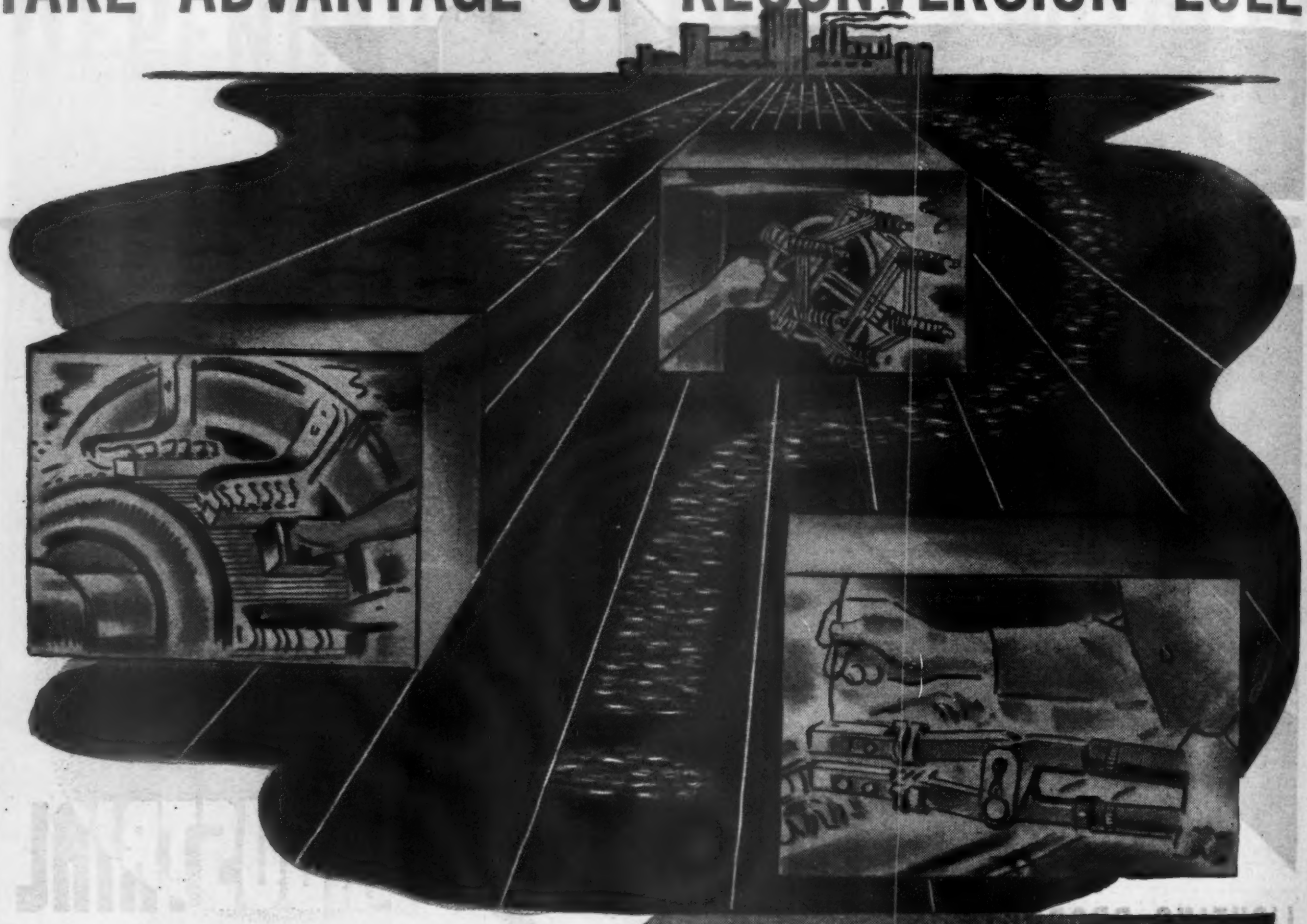
Following are the features that makes these leading luminaires—

Patented "One Man Installation" — Designed for any type of hanging, including continuous runs—Metal drop ends for socket protection — Separate starters on conventional type units — Third lamp may be added later on two lamp units—Knockouts in ends for pull chain switches—Twice fired baked enamel reflectors—All units die formed and electrically welded—Underwriters approved.

The Instant Start Series No. 130-A can be operated on uneven voltages and at low temperatures. This type of fixture requires no starters and turns on and off like an incandescent fixture. Its transformer is guaranteed for a full year against defects.

LIGHTING PRODUCTS, INC.
HIGHLAND PARK • ILLINOIS

TAKE ADVANTAGE OF RECONVERSION LULL



Use *Modern* IDEAL Motor Maintenance and Repair Equipment to Restore Motor and Generator Efficiency ... INEXPENSIVELY!

There is a big post-war job ahead, restoring to tip-top condition motors and generators war-weary from their years of gruelling "round-the-clock" service. IDEAL'S complete line of Motor Maintenance Equipment quickly reconditions over-worked motors and generators *without taking them out of service.* The IDEAL line of money-saving equipment includes ***100 products*** serving more than ***40,000 customers*** through ***200*** IDEAL ***Service Engineers.*** Stocks carried at the plant, in warehouses and with wholesalers in all principal cities.

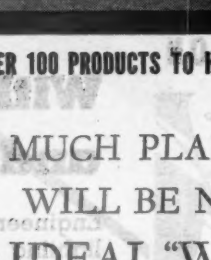
Ask for the 88-page IDEAL Handbook giving complete information.

IDEAL *Sycamore*

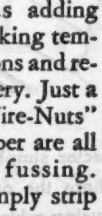
IDEAL COMMUTATOR DRESSER COMPANY
1041 Park Avenue ★ Sycamore, Illinois

OVER 100 PRODUCTS TO HELP ELECTRICITY SERVE BETTER

MUCH PLANT REWIRING WILL BE NEEDED—USE IDEAL "WIRE-NUTS"...



for lower-cost wire joints when making plant changes such as adding new circuits, making temporary installations and relocating machinery. Just a pocketful of "Wire-Nuts" and a wire stripper are all you need. No fussing. Easy to use. Simply strip wires—screw on—that's all. These solderless, tapeless wire connectors make a neater, safer wire joint—better electrically, stronger mechanically. Approved by Underwriters' Laboratories, Inc., and are *available without priority.*



STOCK DELIVERY

SOLD THROUGH JOBBERS

RUSSIA

Threat . . . or Promise?

WHEN this war is ended, two nations—the United States and Russia—will possess the bulk of the world's military and industrial might.

Whether this new situation will hold seeds of catastrophe or of unprecedented opportunity will be determined by policies . . . still to be formulated.

If this concentration of power leads to a bitter struggle for supremacy, then the world will be turned into a giant munitions factory.

If it is used cooperatively to maintain order, then, I believe, the stage is set for a long era of prosperity . . . and peace.

It is time that Americans, whether of the Right or the Left, face this basic issue squarely and open-mindedly.

☆ ☆ ☆

No group in this country has a greater stake than have business and industry in seeing that a satisfactory Russian-American understanding is reached.

Without such an understanding there can be no reasonable hope for more than a temporary and insignificant reduction of our crushing wartime tax burden. If the threat of a clash between these two giants impends, neither bankers nor governments will run the risk of lending on a scale adequate to maintain international trade at levels necessary for our future prosperity. Potential international customers, instead of buying freely in open world markets, will be forced—as during the dangerous period introduced by Hitler in the early 1930's—into the trading camp of whichever power they fear most.

If, however, Moscow and Washington will agree on cooperative plans for maintaining the peace, American business will enjoy enormous new trade opportunities after the war.

☆ ☆ ☆

Russia, during the three and one-half years since it was attacked by Hitler, has conclusively proved to a doubting world that it is a top-flight military power.

Soviet railroads did not break down under the strain of war.

Regions accounting for nearly 70 per cent of Stalin's key industries were engulfed by the invading Nazis, but before they fell, Soviet management engineers performed a near miracle by transplanting entire industries a thousand miles to the Urals with the loss of as little as four months' production in many cases.

Though American planes, trucks, and medical supplies have been welcomed by Moscow, fairness demands the admission that more than 98 per cent of American production has *not* gone to the Russian front.

Russian planning and *Russian* equipment won the victories of Leningrad, Stalingrad, and the Caucasus.

☆ ☆ ☆

But these measures of Soviet military strength—indicative as they are of an unsuspected economic development—fail to picture in adequate detail the startling potential of the Russian market after the war.

Russia, for instance, has two and one-half times the area of the United States.

It has a population of nearly 200,000,000, and this is increasing at the rate of 2,500,000 a year.

And statistics just released show that Russia has three times as many youngsters under 16 as has the United States. This is a measure both of war potential and of a vast commercial market.

And remember that in no part of the world before the war was per capita production rising as rapidly as in the Soviet Union.

☆ ☆ ☆

German armies occupied a region in Russia roughly equivalent to the territory in the United States north of Richmond, Virginia, and east of the Mississippi.

This huge area—with its counterparts of Pittsburgh, Buffalo, and Bridgeport; of Illinois corn fields, New York dairy farms, and Maine potato harvests—was *twice* subjected to the most withering destruction; first by the Russians themselves when they retreated before the Germans, and then by the Germans when they withdrew before the victorious Russians.

As a result, 30,000,000 people are in urgent need of complete reoutfitting. They need houses and shoe laces, trolley cars and baby carriages, tractors and livestock, hydroelectric plants and electric light bulbs.

Many of these needs will be met at home. It is doubtful, for instance, if Moscow will import cooking utensils or sewing machines, for many of Russia's huge war factories can quickly be converted to peacetime production of such consumer goods.

But for the rebuilding and expansion of her industries Russia looks to the United States for equipment.

Soviet representatives already are in this country with authority to negotiate for technical men and the equipment necessary to rebuild the great Donbas coal mines according to the most modern American methods.

It is important to remember that Russia's whole iron and steel industry, its non-ferrous mining and processing, some of its chemical production, much of its coke roasting and gas recovery, practically its entire automobile and tractor industry, and the largest of its hydroelectric plants, are based on American machinery and processes.

It is known among manufacturers that Russia recently has asked for bids on shipbuilding equipment, construction and roadbuilding machinery, alloy steels, textile machines, plastics, and a long list of rail, air, and water transport supplies.

☆ ☆ ☆

The Soviet Union, however, has more than a rehabilitation job on its drawing boards.

The first Five-Year Plan, which, as we all remember, was completed ahead of time in 1932, was devoted almost exclusively to heavy industry. Russia set out to build for itself the machines and the factories which, in later years, could turn out, at home, modern equipment for a vast range of light industries.

Stalin, when he inaugurated the second of his famous Five-Year Plans, promised that before it was completed Soviet factories would begin to turn out a flow of con-

sumer goods—ready-made dresses, canned foods, soap, cosmetics, shoes, kitchenware, automobiles, telephones, and modern houses.

But, by 1935, Moscow realized that Russia could not afford to enjoy such luxuries in the face of growing political tension in Europe. So, when the third Five-Year Plan was launched, there was no fanfare. Russians continued to wear their old clothes, to eat whatever simple food was available, and began grimly to build the industries which ultimately produced enough tanks, planes, and guns to turn the tide of battle at Stalingrad.

It is characteristic of Moscow that even before the last battles with the Nazis are over, Russia is planning to pick up its Five-Year Plans where the war had interrupted them.

Invitations to participate in a permanent exhibition in Moscow already have been mailed to American manufacturers. Soviet officials want their public to see samples of our new machine tools, aluminum and alloy products, oil-drilling machinery, bulldozers, and prefabricated kitchen equipment. Russia already is projecting specific plans to resume the job (1) of making the country an industrial giant comparable to the United States, and (2) of making life more pleasant for a long-suffering people.

☆ ☆ ☆

What is the measure of this postwar market in the Soviet Union?

Some estimates place the total quantity of goods which Russia might take from the United States during the first two or three years after the war as high as $5,000,000,000 a year. Then, as Russian industry is restored, imports from the United States might taper off perhaps to $2,000,000,000 a year.

Actually, these estimates are far too optimistic, unless the United States is prepared (1) to help Russia pay by buying vast quantities of Soviet raw materials, and (2) to provide large credits to handle the purchases during the first few years of rehabilitation.

The relations of American exporters with Russia during the period covered by the three Five-Year Plans have been eminently satisfactory. Moscow has met all of its obligations punctually; fifteen years of experience have reduced contract forms to the point where they cause a minimum of misunderstanding between the Russian representatives and the American producers; individual American companies with extensive prewar experience in handling Soviet business already are offering large credits on initial postwar orders though these may yet be replaced by large government credits at lower interest rates.

But the volume of trade with Russia after the war hinges upon Moscow's ability to pay. Never before the war did the United States buy more than $30,000,000 of goods a year from Russia. As late as 1938, Soviet exports to this country amounted to as little as $23,500,000, far less than enough to pay even the service charges on the credits which would have to be extended in connection with exports of several billion dollars a year. Only South Africa produces more new gold each year than the Soviet Union. But the United States does not want gold; more of it would only complicate the problem of controlling prices here.

If the United States, however, is to achieve, after the war, the high level of national income which is necessary (1) to keep our expanded factories in operation, and (2) to service the national debt, it might absorb from $90,000,000 to $100,000,000 a year of the kind of goods bought from Russia before the war—furs, timber, manganese, chromium, and handicrafts. But unless this volume of purchases from Russia can be boosted by another $50,000,000 annually, credits of the size necessary to fill immediate Russian needs could not be serviced without large supplemental importations of undesirable gold.

The nub of the situation is that Russia offers an extraordinary potential market particularly for our heavy industries which have grown so enormously during the war. But if this sales outlet is to materialize, then the United States must find a way to import from Russia (or from Russia's debtors if any) from ten to twenty times as much as we did before the war. Instead of merely going after the export business, American businessmen must explore with the Russians the possibility of buying bigger supplies of Soviet products.

☆ ☆ ☆

But more than the Russian market itself hinges upon sound cooperative action by the world's two leading military-industrial nations.

If trade between them is held to a minimum and if relations are strained, the flow of trade all over the world will be adversely affected.

Europe, long this country's biggest export outlet, certainly will never take the bold steps necessary to reconstitute its economy on a peacetime basis if Russia and the United States drift into a race for military supremacy.

The Balkan states, which may be industrialized by Moscow in order to reduce their dependence on Germany, and the Arab world with its huge need for transportation, irrigation, and sanitation, will not dare accept American credits or make big contracts with American engineers if Moscow frowns on the deals.

And refusal of Russia and the United States to work cooperatively to maintain the peace would kill, in their present embryonic stage, all dreams of a vast industrialization program for China.

☆ ☆ ☆

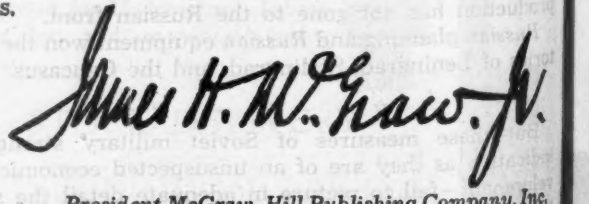
The opportunity to make a major change in the trade map of the world and at the same time to achieve a sharp rise in our own standard of living is before us.

It demands of American business leaders the kind of boldness and imagination that their predecessors displayed when they pioneered this country's unknown West.

It demands realistic action by men who know that the solution to this country's *real* foreign trade problem under today's conditions lies in boosting *imports* not exports alone . . . men who are not afraid of being paid for what they sell.

It calls for leaders who will approach Moscow and other major customers at once with constructive plans that would parallel in scope those on which this country is waging war . . . leaders who will make it clear at the outset that this bid for cooperative action emphatically demands that each nation shall have complete freedom to determine its internal political and economic organization without interference from the other.

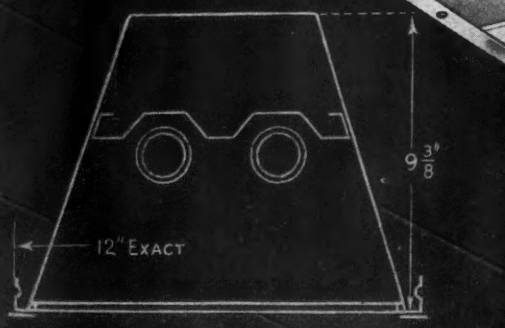
It is *this* caliber of leadership upon which our future hinges.



President McGraw-Hill Publishing Company, Inc.

THIS IS THE 29TH OF A SERIES

Leader Announces recessed troffer units!



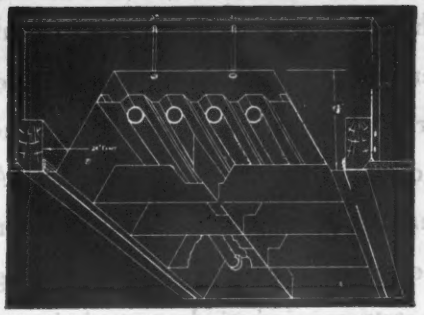
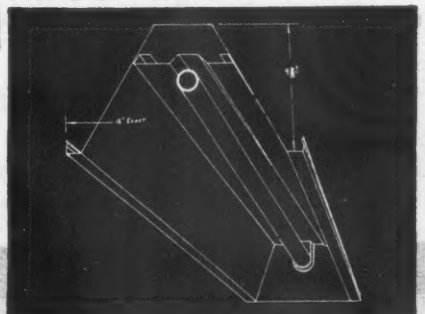


Illustration of 24" four light section with louvers. This is also furnished open or glass enclosed with either two or four 40 watt bulbs.

Versatility in installation, the most important single feature in any troffer unit, has been particularly stressed in the design of the new Leader Recessed Troffer Units.

The Leader Recessed Troffer Units are designed and manufactured so that they can be installed almost anywhere. Architects will find that they lend themselves to modern trends in architecture and improved lighting technique.

LEADER EXPERIENCE PLUS LEADER QUALITY INCORPORATED IN THESE TROFFER UNITS



Drawing illustrates 12" one light open unit. This unit is also furnished glass enclosed or with louvers, with either one or two 40 watt bulbs.

The Leader Troffer Unit is manufactured with the same standards of quality and workmanship that have made other Leader fixtures outstanding in the lighting field.

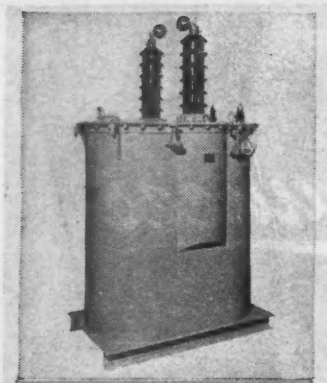
A single unit or by the mile they are easily installed and cheaply maintained.

Constructed for conventional or instant start operation. These units are also designed to take the new 7' 9" lamp when this equipment will be available. Contact the Leader Representative in your city for plans and suggestions on Leader Troffer Units.

★

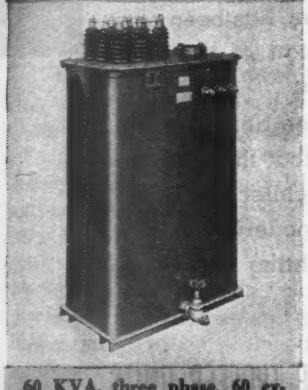
DISTRIBUTED ONLY THROUGH THE BETTER ELECTRICAL WHOLESALERS

Leader ELECTRIC MFG. CORP. • 6127 BROADWAY CHICAGO 40, ILLINOIS

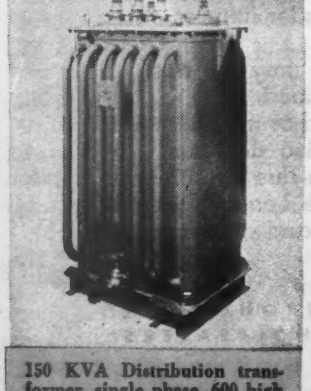


Single phase, half wave rectifier plate transformer, 60 cycles, 220 volts primary, 110,000 volts secondary.

300 VA Filament transformer, single phase, 60 cycles, 6 secondary windings of 5 volts each; 3 secondary windings operating 40 KV above ground and 3 secondaries operating 20 KV above ground.



60 KVA, three phase, 60 cycles, 211 volts, Delta primary, 3900 / 6755 / 7800 / 13510 volts Wye secondary.



150 KVA Distribution transformer, single phase, 600 high voltage, 240/120 low voltage.

Fire!

REDUCE THE HAZARD WITH AMERTRAN ABESTOL IMMERSED TRANSFORMERS

Fireproof AmerTran Abestol Immersed Transformers reduce both the possibility and the extent of fire damage. That's why they earn lower insurance rates and permit vaultless indoor installation, with its convenience, flexibility and accessibility. To industry, AmerTran Abestol Immersed Transformers offer the advantages of load center installation: copper savings, finer voltage regulation, lower line losses and improved motor performance. If necessary, they may be mounted overhead because the chemically inert Abestol, which requires no maintenance, is sealed. In comparison to transformer oil, Abestol possesses higher insulating properties and similar heat transmission characteristics.

Send for further information.

AMERICAN TRANSFORMER COMPANY
178 EMMET STREET, NEWARK 5, NEW JERSEY

AMERTRAN

Pioneer Manufacturers of Transformers, Reactors and Rectifiers for Electronics and Power Transmission

MAXIMUM SALES VALUE

WIRING PROSPECTS QUICKLY SEE THE ADVANTAGES OF

PORCELAIN PROTECTED WIRING SYSTEMS

★

You not only have an easy job in selling Porcelain as a wiring material, but in so doing you build future wiring business for industrial, commercial, and residential installations. People far and wide have learned that porcelain wiring provides complete and permanent protection.

The increase in Porcelain Protected Wiring System installations in recent years indicates the profit possibilities for you, not only now but for the years immediately ahead with increased wiring requirements.

When you check all of the benefits afforded by Porcelain Protected Wiring Systems you see why you have the modern answer to wiring.

Porcelain Protected Wiring Systems include the use of and have as their components, Porcelain Knobs, Tubes, Cleats, and Porcelain Outlet Boxes, Switch Boxes, and Covers.

Your CUSTOMERS Get All This

- Complete Insulation
- Full Protection
- Short Proof
- Shock Proof
- Rust and Corrosion Resistant
- Permanent
- Adequate
- Economical
- Maximum Current Capacity Ratings
- Takes Standard Devices and Fixtures
- Meets Future Load Increase
- Allows for easily made Alterations and Additions

★ **ILLINOIS ELECTRIC PORCELAIN CO.**
Macomb, Ill.

★ **PORCELAIN PRODUCTS, INCORPORATED**
Findlay, Ohio

★ **SPECIALTY PORCELAIN WORKS**
East Liverpool, Ohio

★ **SUPERIOR PORCELAIN COMPANY**
Parkersburg, W. Va.

★ **UNIVERSAL CLAY PRODUCTS COMPANY**
Sandusky, Ohio

MODERN PORCELAIN PROTECTED WIRING SYSTEMS

GET RID OF THE *Sacred Cow* IN WIRING!

In electrical wiring of buildings, the costly custom of using No. 14 has blocked progress toward adequate wiring like the sacred cow on an Indian road. The Hindu, you recall, reveres the cow and will not disturb it, regardless of time or place. But, if our buildings of tomorrow are to have proper wiring, then sacred cows like No. 14 must yield to progress.

A first and basic step towards realization of the adequately wired building should be insistence that the sacred cow of No. 14 must go. Its anemic circuits have deprived many a building of full use of available power. To take full advantage of the electrical world of tomorrow, wiring must be planned with an eye to the future for the greater use of electrical equipment. The Okonite Company, Passaic, N. J.

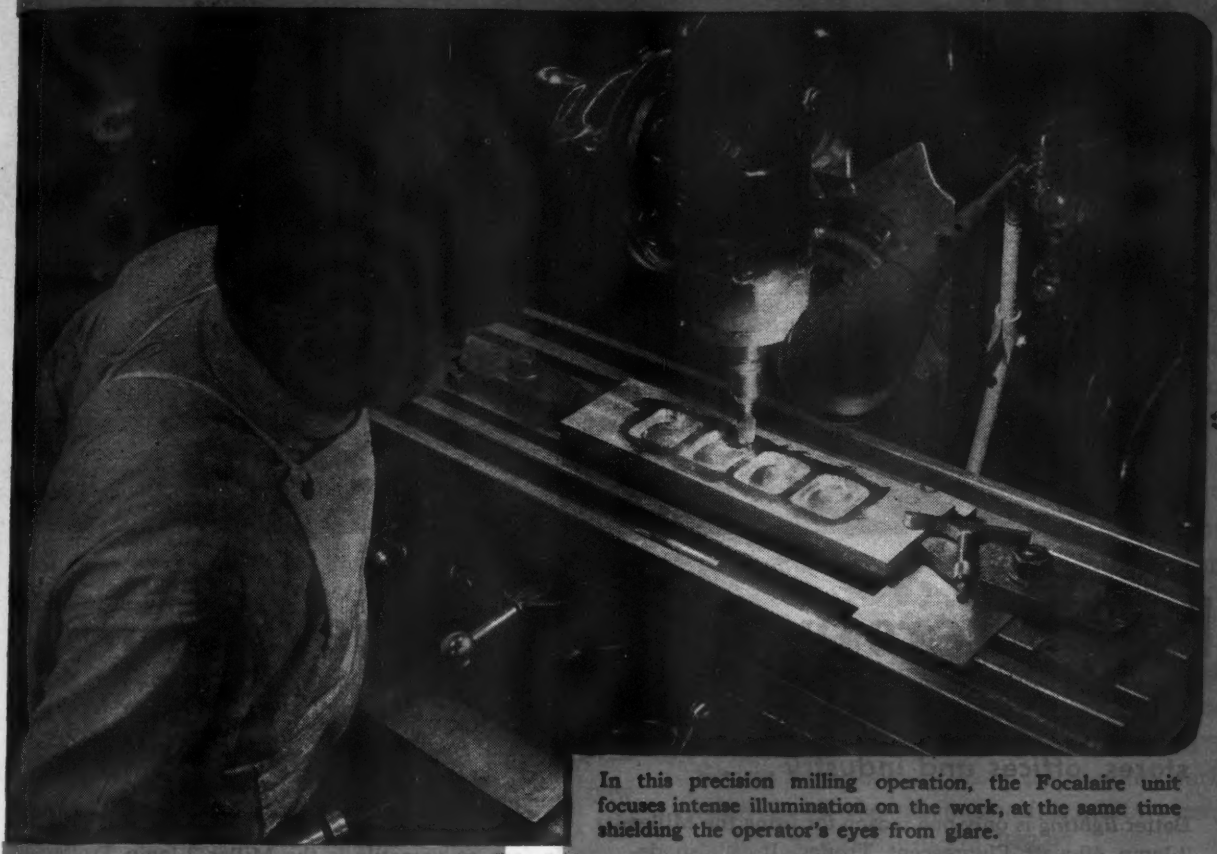
OKONITE and HAZARD
insulated wires and cables

To wire a building adequately, no smaller wire than No. 12 should be specified. Only one size larger, it will carry one third more current, reduce voltage drop by more than a third, deliver more power for your money and yet requires no larger conduit or fittings.

ADEQUATE WIRING THE KEY TO INCREASED PRODUCTION

guess I had better ALWAYS figure on nothing smaller than #12 when quoting ARCHITECTS and OWNERS after this!!!

Proportional lighting SAVES COSTLY MISTAKES



In this precision milling operation, the Focalaire unit focuses intense illumination on the work, at the same time shielding the operator's eyes from glare.

FOCALAIRE Features

1. Quickly adjusted by simple ball and socket joints.
2. Shake-proof . . . resists machine vibration.
3. All parts are welded for strength.
4. Wire is run inside of tubular arms and has oil-resistant insulation.
5. Reflector is spot-welded to socket guard.
6. Six standard types, with regular machine-tool gray finish.
7. Special sizes can be made up from standard arms, reflectors and bases.

GENERAL + SUPPLEMENTARY = PROPORTIONAL LIGHTING

Proportional lighting is the right combination of general and supplementary lighting which produces excellent seeing conditions at critical work areas. For supplementary lighting, Westinghouse offers a complete new line of Focalaire units.

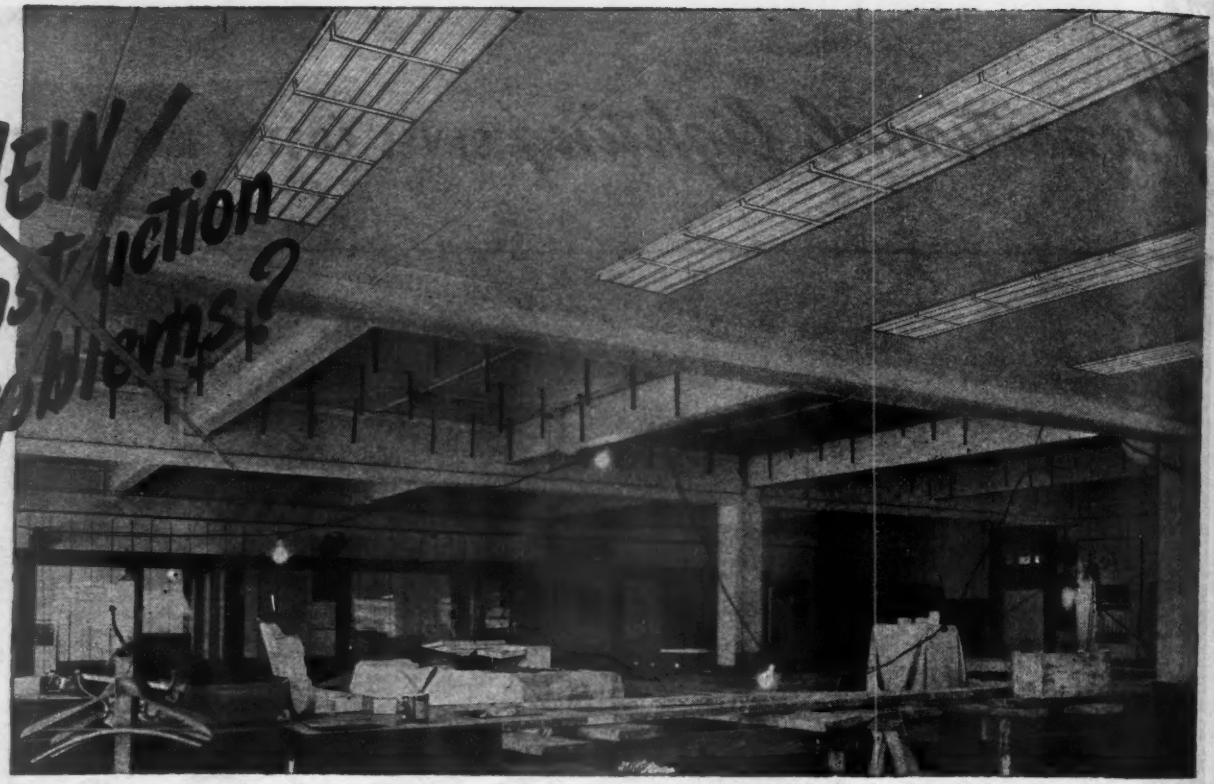
These convenient units are available in a variety of standard sizes and styles for bench or table operations, small machines, and large machine tools. Other sizes can be quickly assembled from standard bases, arms and reflectors. All are designed for convenient mounting and easy, firm adjustment.

For full information, call in your Westinghouse Lighting Distributor, or write Westinghouse Electric & Mfg. Company, Department 7-N, East Pittsburgh, Pa. Ask for B-3310. J-04000

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

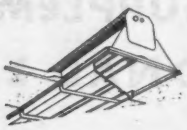
Lighting Equipment



Miller Troffers even solve some *old* ones!

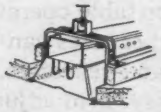
In the fluorescent lighting of schools, stores, offices and industry . . .

Better *lighting* is only one reason for using the Miller 2-lamp 40-watt Fluorescent Troffer. It is also designed to be the most *practicable* fixture to plan *around*—and build *with.*



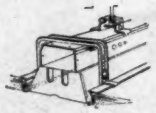
Troffer in position in either plaster or acoustic tile ceiling.

The patented Miller Troffer makes it possible to hang this lighting fixture from the structural ceiling—and then hang the false ceiling *from the lighting fixture!* Here's how it works in a ceiling with wood furring:



Bracket for wood ceiling.

This effects economies, assures stronger construction and adds flexibility to the entire installation. And it's just as easy to do with a ceiling using metal furring.



Bracket for metal ceiling.

In fact, so versatile is the Miller 2-lamp Troffer—in single units, unit combinations, or in continuous lightstrips "by the mile"—that its applications are practically as unlimited as the architect's ingenuity.

Other exclusive Miller features, developed in our 100 years of pioneering, include continuous wireway channels (just like in the Miller industrial 50 and 100 foot Candlers), hinged cover doors with plastic or glass dishes, ribbed or fluted—or prismatic glass plates—or grills of metal or plastic. These help make the Miller Troffer simple to service and so economical to operate that completely new standards of illumination become feasible.

We may seem to claim much—but we work with all light-sources (including mercury-vapor and incandescent), so our judgment is unbiased. So call in a Miller Engineer—they're in principal cities—or call us directly—and see why The Miller Company is starting its *second* hundred years, still in the lead!

THE MILLER COMPANY • MERIDEN, CONNECTICUT

ILLUMINATING DIVISION
Fluorescent, Incandescent
Mercury Lighting Equipment

OIL GOODS DIVISION
Domestic Oil Burners
and Liquid Fuel Devices

ROLLING MILL DIVISION
Phosphor Bronze and Brass
in Sheets, Strips and Rolls

WAR CONTRACTS DIVISION
War Materiel

MILLER
SINCE 1844

Whatever the lighting problem

SOLA makes the correct

TRANSFORMER

Lighting was called upon to do a tremendous job in 'round-the-clock war production. Lighting did it—in the factory, in the office, in the home. Lighting methods have changed and the transformers that supply the power have changed with them.

In effecting these changes in transformer design SOLA engineers have contributed an impressive array of *original* engineering concepts.

War-time restrictions still surround many of the transformers that we are now manufacturing for important assignments in the war effort—yet the day is not far distant when these new designs, priority free, will be available to the lighting industry.

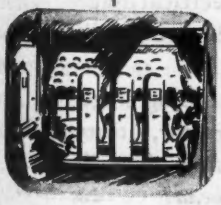
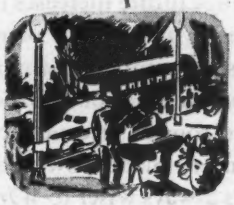
★

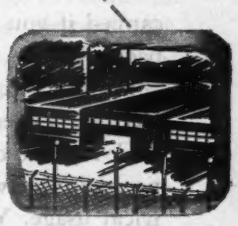
FLUORESCENT LIGHTING. In this important field SOLA'S new transformers have been closely aligned with the new developments in tubes and fixtures. Our ballasts for long continuous lamps, in which we have included our famous Constant Voltage principle, have been responsible for the unvarying light intensity in hundreds of important war plants regardless of the unstable voltages induced by unpredictable power demands.

SOLA transformers for fluorescent lighting still rate top preference with important fixture manufacturers. Ask for Bulletin JFL-86.

SERIES LIGHTING. For street lighting, protective lighting, runway markers, flood lights—wherever the power supply must be sealed against dust, moisture and weather, SOLA'S new Series Transformers have excelled in performance under the most exacting military requirements. Ask for Bulletin JSS-97.

POWER DISTRIBUTION transformers of the conventional double wound, auto types, either step-up or step-down, have also been modernized to meet changing conditions. Ask for Bulletin JDW-101.

MERCURY LAMPS • STREET LIGHTING • FLUORESCENT • AIRPORT LIGHTING • PLANT LIGHTING

SOLA Lighting Transformers

Transformers for: Constant Voltage • Cold Cathode Lighting • Mercury Lamps • Series Lighting • Fluorescent Lighting • X-Ray Equipment • Luminous Tube Signs Oil Burner Ignition • Radio • Power • Controls • Signal Systems • Door Bells and Chimes • etc. **SOLA ELECTRIC CO., 2525 Clybourn Ave., Chicago 14, Ill.**

Because of the basic importance of adequate wiring to the entire electrical industry, Anaconda is presenting messages like this in a wide list of national publications.

IT'S YOUR POSTWAR ELECTRICAL HOME

—See that it works!

THINK of your electrified home to come . . . big and little appliances of all kinds . . . advanced heating . . . air-conditioning . . . better lighting . . . television . . . All fine servants—but they will be handicapped if you give them insufficient electrical capacity.

So often electrical wiring plans are based on *past* electrical experience—a poor guide to the needs of peak loads to come. It's far safer to plan *reserve* capacity in line with the huge future increase in electrical usage. You'll save yourself plenty of grief later in breakdowns and expensive alterations.

Manufacturers! Apply this in terms of industrial equipment in *your* business. The problem's the same. Make sure you have ample electrical capacity to meet the huge future increases in electrical usage sure to come. In plants too, planned wiring will cost a lot less than unplanned wiring.

Before structures get out of the planning stage, it will pay to consult electrical contractor, utility power engineer, plant power engineer. They'll agree that it's always wiser to *Wire Ahead!* 44205

ANACONDA WIRE & CABLE COMPANY

25 Broadway, New York 4 . . . Sales Offices in Principal Cities

It's Always Wiser to TELEGRAM WIRE TELEGRAM AHEAD

TIME FOR ACTION

At the NECA meeting last month, at the recent League Conference and other industry forums over the land, we have seen plans that were only bare outlines a few months ago, rounding out into clear perspective. Postwar committees of every branch of the industry have worked well and intelligently. The plans are realistic and look toward the major interests of each group.

The next step is coordination. It is obvious that the full measure of electrical development, in the public interest and in the interest of every group in the industry, cannot be reached without the vigor and vision of many men working for a common cause.

Can a great, diverse industry of power companies, manufacturers, distributors and contractors find a common cause? We are all tempted to confidently answer, "Yes, we shall because we must!" But it is not as simple as that. First must come understanding and a will to do the job. Then we shall find common cause because we want to. And in striving for common goals we shall find our own rewards multiplied many times.

That's not old time religion. It's a basic appraisal of the job ahead. In the electrical industry there is great danger of setting our sights short of the goal. Even today, after years of war business, demonstrating the tremendous capacity of an industry with a common purpose, there is still a reluctance to see postwar market development as more than appliance sales, load building, apparatus promotion, adequate wiring or industry stabilization.

Wiring in 95 percent of our existing homes is insufficient for present loads. Commercial building wiring is in such a bad way that it is a question whether the feeders are not doing a better job of heating the pipe shafts than of providing efficient light and power. War loads have strained the capacity of industrial wiring systems far beyond safe limits. And from all sides we hear talk of new devices, appliances, lighting, machines; new loads in prospect threaten to make our present concepts of electrical utilization obsolete.

Those who heard the NECA, NEMA, NEWA, and EEI plans outlined from the same platform at French Lick enjoyed a great opportunity. Between the lines and through the overlapping objectives were common areas of action—and whether stated or not—these areas involved the function of the electrical contractor, the dealer and the electrician. The reason is simple. It is here that the great variety and scope of materials and services are transferred into facilities for electrical living.

Those who have grasped this important relationship —who see that a fixture is not lighting, that a glue pot is not load, that a motor is not power until it has passed through the process of skilled treatment at the installation level—can understand the vital need for great goals and common purpose. Lamps and locknuts, toasters and transformers, capacitors and cables are all related factors in one big formula.

And industry-wide understanding of this fundamental will give us the will to join forces, to see our own postwar objectives as part of a great forward movement toward new levels of electrical development. It is time now for broad scale thinking. It is time for all-industry action.

Wm. T. Stuart

Post-war pipe dreams your customers can't count on

ELECTRONIC THOUGHT-TRANSFER FOR EXECUTIVES — They can't just think of a job that needs doing, and pronto! — the right man to do it receives his instructions — electronically! Like so many electronic miracles, it may come, but it's *not* just around the corner.

BUT THEY CAN PLAN RIGHT NOW

INSTANT COMMUNICATION WITH ANYONE — OR EVERY-ONE — IN THEIR PLANTS

Plants all over America have outgrown their intercommunication systems. Some plants, which need them, have none. They can use you to install and service Webster Electric Teletalk; those highly flexible intercommunication systems which permit immediate, full-voiced communication between individuals or departments. If your prospect wants to carry on confidential conversations with key personnel, or make general announcements throughout the plant, you can provide a Teletalk System which will do either — or both. A Graybar Intercommunication Specialist will help you with selection, procurement, and application. Our experience on hundreds of war jobs may help you do a better, more profitable job, as you save your customer's time, steps and temper.

GRAYBAR'S NATIONWIDE NETWORK

of more than 80 warehouses assures you a convenient, local source of supply for more than 60,000 electrical items — backed by experienced application aid on problems of wiring, intercommunication, lighting, and power apparatus. A Graybar Man near you is ready to make the electrical supplies that your contract calls for his personal responsibility. Why not take advantage of his time-saving assistance? 5519

via GraybaR

ADEQUATE WIRING SERVES AND SAVES — THE KEY TO THE HOME OF TOMORROW

GRAYBAR ELECTRIC COMPANY

IN OVER 80 PRINCIPAL CITIES

Executive Offices: 420 Lexington Ave., N. Y. 17, N. Y.

Sectionalized BUS-DUCT NETWORK

High voltage feeders, primary load-center capacitors and a network bus-duct distribution system are features of Remington-Rand plant electrical facilities.

By

Robert E. Miller

ONE of the most modern electrical distribution systems in the country has been installed at Remington-Rand's new Propellor Division plant in Binghamton, New York. Its design provides greater protection than ever before against electric service outage at the utilization point with its consequent interruption to production.

Protection Against Outage

Secondary distribution is made at 120/208 volts through bus-duct laid out in plan similar to that shown in the accompanying diagram. The 1500 ampere mains are divided into six separate sections so that a fault developing on the bus at any point cannot interrupt the entire plant. To provide further protection, each of the six sectionalized bus mains are provided with a number of strategically located fusible adaptor switches over and above those required by the code when telescoping bus sections down below one-third the capacity of the mains. The purpose of the additional adaptor switches is to expedite the localization of trouble.

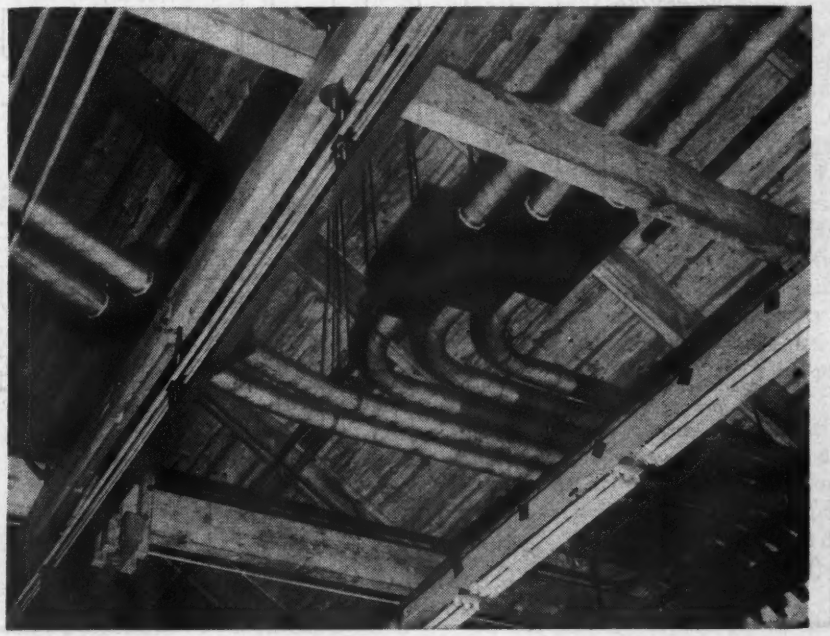
As a further assurance of service continuity, each section is fed by two or more load-center transformers paralleled onto the 1500 ampere bus mains from separate feeders in typical network fashion. Reverse-power relays incorporated into a so-called network protector equipped with air-break switches protects against reverse feed to the primary connections in case of trouble. Five high-voltage, three phase feeders serve the nineteen unit substations throughout the plant.

The plant is a low one-story all wood structure with vaulted roof. The substations are mounted on platforms up in the trusses above the truss-chord line and all are connected by a continuous catwalk.

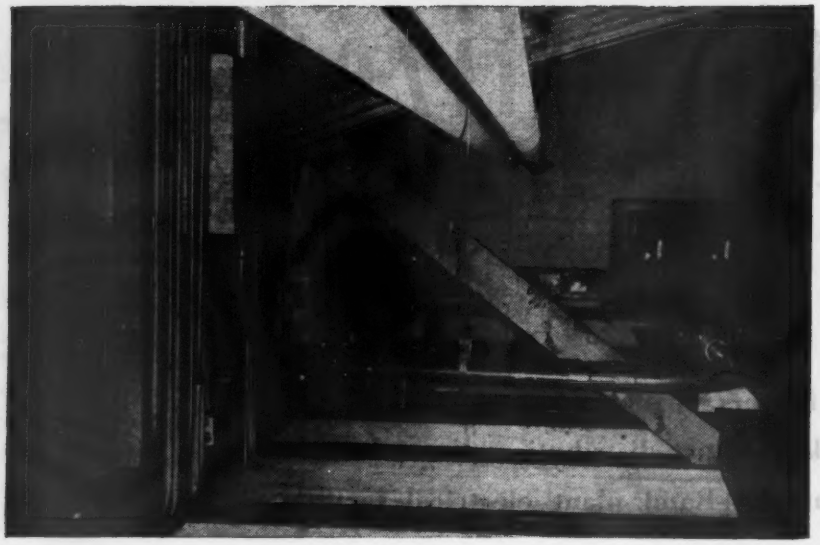
C. H. Crawford, plant engineer and C. L. Wagener, chief electrician, supervised the installation for Remington-Rand. Lord Electric Company were the electrical contractors doing the actual construction work. Wagener was formerly an independent electrical contractor in Binghamton, but liquidated his business to contribute what he could during the construction period from his previous broad background in electrical work, and to organize and operate the required electrical maintenance department.

The main outdoor substation, which is located out-of-doors and at one end of the plant, is constructed entirely of wood. The two separate utility high-lines drop onto the overhead switching structure at 34,500 volts. After passing through fused disconnects, the two primary lines are connected through an air-disconnect tie switch before connection to the main transformers. Thus, the load can be shifted to one high line or to the other, enabling the operating utility to most economically load their over-all system and to provide greater protection against outage.

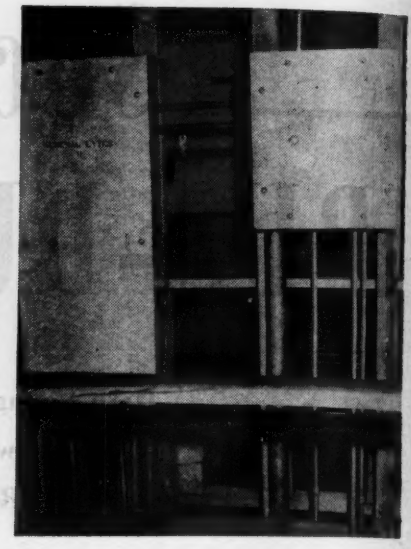
The two power transformers are rated 4000 kva. each, three phase,



***FIVE 4160 VOLT FEEDERS** divide for longitudinal distribution through the plant. The five splice-boxes contain the cable wiped joints.*



***THE BREAKER** plugged into the bus duct on the right is for a lighting circuit which is carried through the conduit in the foreground to the pull box on the left which is mounted directly beneath the catwalk.*



***LIGHTING** and receptacle panels are mounted at side of catwalk directly above the pull box shown at left.*

34,500/2400/4160Y grounded neutral. Air blast equipment provides the substation with an additional capacity of 2000 kva.

The outdoor station equipment is housed in eleven cubicles; two cubicles for relaying equipment, one cubicle for metering equipment, two cubicles for the two 1200 amp. transformer-to-bus oil circuit breakers, and six cubicles (one spare) for the 600 amp. distribution feeders.

A grid-type grounding network is used to ground all substation equipment and feeder neutrals. Fifteen foot ground rods of three-quarter inch diameter are driven into the ground over the entire station area on eighteen foot centers.

A bank of eight fiber ducts buried in a concrete envelope carry the feeders from the trench beneath the outdoor cubicles, under the railroad tracks and loading platform, and into the plant. Steel conduit risers take the cables up inside the end wall and into splice boxes which contain the wiped-joints (see photo). Only five ducts are in use now giving three spares for emergency use or for expansion. The

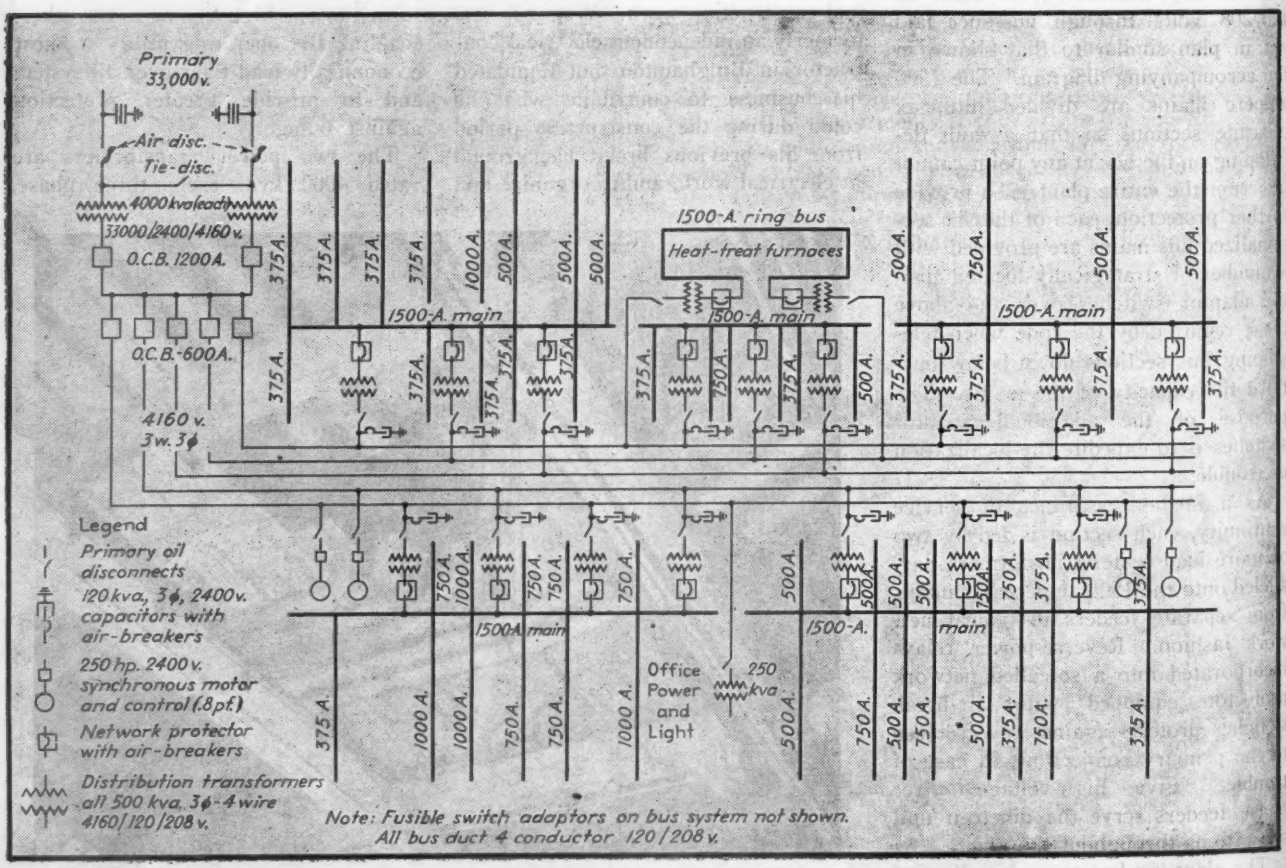
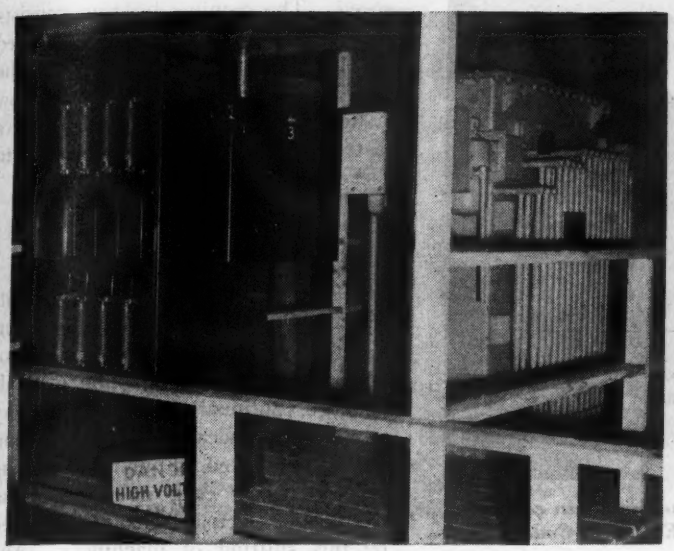


***FIG. 1**—Plan elementary wiring diagram showing sectionalized busduct, high-voltage distribution and unit substations. Fusible adaptor switches not shown.*



***BANK OF PRIMARY CAPACITORS** which are connected in ahead of the load-center transformer. The unit-sub equipment is located on platforms such as this up in the truss work.*

***THE BIG BOX** mounted on the side of the transformer tank contains the network protector equipment and breaker.*

five 4160 volt feeders are three conductor, 500,000 *CM.*, 6000 volt insulation, lead covered cable.

Primary Capacitors

The plant is approximately 500 feet by 1000 feet and the bus-duct mains, which run with the lengthwise dimension of the plant, are located on about 170 foot centers. Consequently, the high voltage distribution feeders divide at the point of entry into the plant with three feeders supplying the west side (which is more heavily loaded because of the electric furnaces) and two supplying the east side light and power requirements.

At each substation supplying an inductive load, primary capacitors have been installed to maintain the overall plant power factor at an economical value because of rate penalties. Out of a total of 19 substations, only three supply non-inductive loads; one for office power and light and two supplying the resistance furnaces. Thus, a total of 16 three phase banks of high voltage capacitors are installed just ahead of the 500 kva. load center transformers. In general, each bank is rated 135 kva. and consists of 15 kva., 2400 volt units connected in wye. The units are protected by high voltage fuses and air-break disconnects.

The mid point of the wye is grounded as is the neutral of the secondary 120/208 v. four-conductor bus duct, to the driven ground at each of the 19 substations. Then all the station grounds are tied together and bonded onto the plant's six-inch water main.

Gang-driven oil disconnects are provided in the transformer primary. Secondary protection is afforded by air circuit breakers incorporated in the network protectors. The network protector is required to prevent reverse power flowing into a primary fault. Since the secondary bus is supplied by transformers paralleled from separate feeders, dangerous amounts of reverse

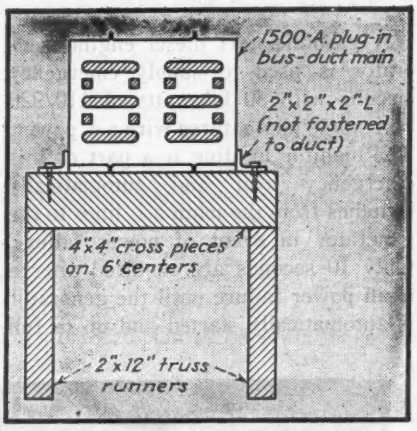


FIG. 2—Typical mounting detail showing the relative locations of the six line and eight ground conductors in the 1500 amp. main duct.

power could conceivably flow from a transformer, through the secondary bus, back through a transformer on a faulty feeder, and into the primary fault.

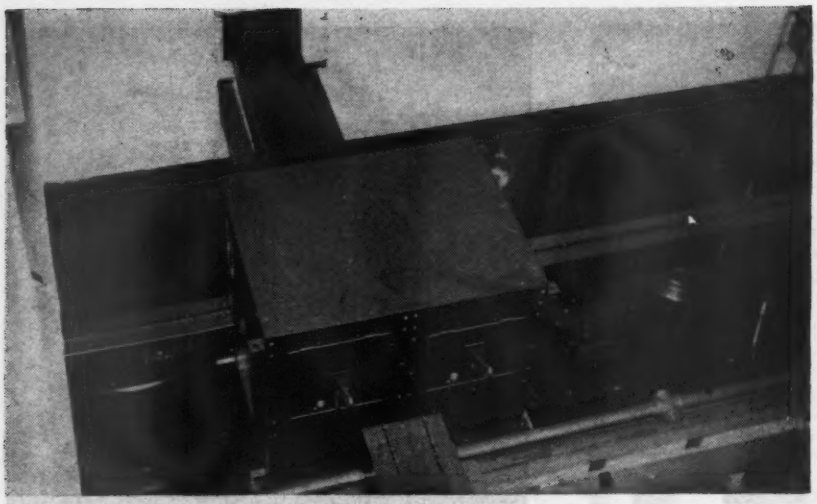
Since the new plant was to produce an urgent war item, immediate production was of utmost importance. As soon as construction had advanced to the point where it could house machinery, production was immediately initiated. However, to supply power to these production machines was quite a problem, since the 500 kva. distribution transformers were only dribbling in from the manufacturer. In the beginning there were not even enough transformers in number to supply the six separate sections. To meet the distribution problem adequately, the two main bus ducts were run continuously down the entire length of the plant and both ends were connected to form a complete loop. One thousand amp. duct, ultimately used for branch runs, was used for the end connections.

As the transformers were delivered one by one, they were installed in their permanent locations, but at strategic points to most adequately serve the greatly expanding load. Finally, after all were put into operation, the various main runs were sectionalized merely by dropping ten foot sections, and the end-loop 1000 amp. ducts removed to their permanent branch locations.

Further flexibility and protection against outages has been provided by the use of fusible adaptor switches at certain of the branch circuit junction points with the main runs. In addition, the National Electrical Code requires that if the duct carrying capacity at any point is reduced to one-third or below, a fusible switch must be provided.

The system, in plan, is similar to that shown in the accompanying diagram. The main runs are 1500 amp. and run the full 1000 feet length of the building. The branches vary from 375 amp. to 1000 amp. in capacity and from 60 feet to 175 feet in length.

In addition to the five sectionalized longitudinal mains, a loop of 1500 amp. bus duct serves the small heat treat



WHERE BRANCH DUCT runs are below one-third the main run capacity, a fusible adaptor switch is required by the National Electrical Code.

area supplying power exclusively to four 69 kw. and four 103 kw. electric resistance type furnaces. Each end of the loop is connected to a separate distribution transformer served from separate feeders.

The rotating equipment load totals to some 16,000 horsepower. A good portion of this is made up of small drives on machine tools and the like, and range from fractionals up to 40 and 50 hp. Four 250 hp., 80 percent leading power-factor synchronous motors driving compressors accounts for 1000 connected horsepower. Forty-eight dust collectors requiring from 60 to 80 hp. each (in two motors) accounts for another 3600 hp.

Lighting Circuits

The lighting circuits are supplied from three-pole solid neutral magnetic breakers plugged directly into the 1500 amp. mains. Four wire, 42 circuit panels are provided for branch-circuiting, and in addition each panel contains a 200 amp. magnetic breaker controlled by push button from convenient locations on the floor. Thus the entire section can be turned on or off as required. Each circuit controls seven fixtures with three 40 watt white tubes per fixture. The branch breakers are resetting, non-fusible type.

Floor receptacles are likewise served from a separate four wire panel of non-fusible circuit breakers, located on the catwalk, and served separately from a magnetic breaker plugged directly into the 1500 amp. mains.

The lighting load alone runs better than 1000 kw. for just the plant, and this figure does not include monitor lighting, office lighting, outdoor lighting and local lighting on machines, and that used for inspection. Over 15 miles of fluorescent tubing is used for plant general illumination. A group replacement maintenance schedule based on 3000 hour lamp life is strictly adhered to. At replacement time, new starters are installed, ballasts and connections are checked, reflectors are washed, and an initial level of 48 foot-candles is attained. This drops off to about a minimum of 30 foot-candles at the end of 3000 hours.

Emergency Unit

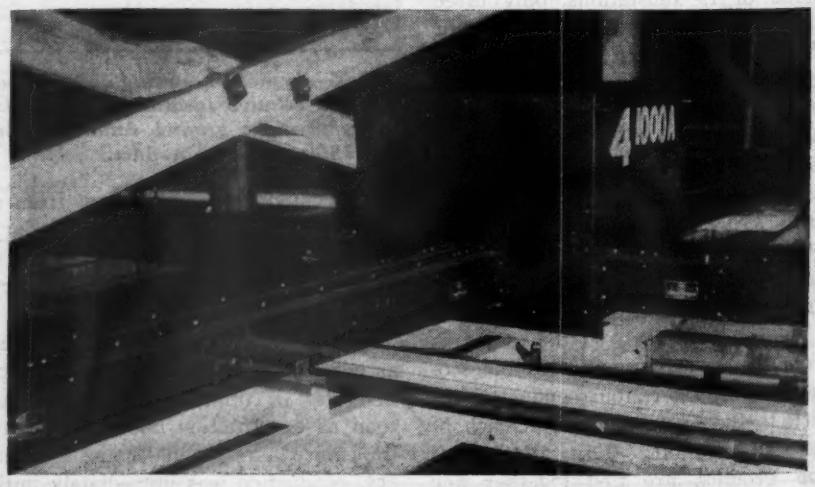
A gasoline-start diesel engine generator is used to supply emergency circuits with 30 kilowatts of 110/220 volt single phase, three wire a.c. power. The monitor lighting is a part of this emergency load and automatically switches from the main a.c. lines to the generator in event of power failure. Only 10 seconds are required after a main power failure until the generator is automatically started and up to full speed. The monitor lighting consists of 150 watt incandescent units located on 100 foot centers throughout the plant. A relay and double throw switch provides the automatic feature in transferring the monitor circuits to the generators.

Flexibility

The bus duct has provided a flexibility that has proven absolutely essential to continuous and economic production. Because production methods undergo continual changes, machinery as a consequence, likewise is continually being shifted. Four men working seven days a week do nothing but handle the electrical changes required by this shifting of machinery. Any other type of distribution system would have made this continual reconversion problem extremely costly.

The installation of the capacitors and the effect of the synchronous motors has maintained an excellent power-factor which has paid dividends in rate concessions. The average power-factor over the first 12 months operation has been 96.08 per cent, with a high of 99.8 and a low of 87.2 percent. This low figure was despite the fact that the load was growing from an initial consumption of 426,000 kwh. per month to a maximum of 2,576,000 kwh. per month. Maximum demand for the same twelve-month period has been 4380 kw.

This flexibility in plug-in bus duct distribution is a distinct advantage. It should be given full considereation in engineering a new installation. The higher initial cost of bus duct distribution has been more than offset by the lower operating costs resulting from the quick and easy reconversion made possible by this method.



FUSIBLE ADAPTOR SWITCH at junction of main and branch duct runs used to expedite localization of trouble.

Los Angeles REINSPECTION PLAN

Backed by a workable plan tried out during the depression as a relief measure, the City of Los Angeles is ready to launch an electrical reinspection program immediately after the war.

BACK in the depression years the City of Los Angeles, Calif., organized an electrical reinspection program primarily as a relief measure to give employment to qualified men and at the same time provide an opportunity to catalog electrical hazards existing throughout the city. The plan was feasible but was not a complete success—from the standpoint of correcting hazardous conditions—because the public lacked the funds to comply with the recommendations at that particular period. Now the picture is different. The public will have the funds from accumulated war bonds and savings to rehabilitate electrical systems in accordance with safe standards. The City stands ready to re-install its reinspection program when the proper time arrives.

Los Angeles has a head start with respect to such a plan. The local authorities have ordained a "Right of Entry" in the City Code which permits the Board of Building and Safety Commissioners or duly authorized representatives to enter any building, structure or premises or any portion thereof whenever it may be necessary to make an inspection, reinspection or investigation to ascertain if the provisions have been complied with. Such entrance, however, cannot be made in living quarters without consent of the occupant, nor in industrial or commercial establishments in the absence of the owner unless prior permission has been granted.

The section of the City Code covering Reinspection provides the right to inspect or investigate electric wiring or equipment installed prior to or after effective date of the Article to determine existence of a hazardous condition or violation of the provisions. If conditions hazardous to life and property are found, the department notifies the owner or person in control to cease using electrical current in or through such an electrical installation and to repair the same within a reasonable time—not exceeding ten days. This notice specifies the particular defects and the changes necessary; also the stipulation that repairs must be inspected and approved before being again energized. Using a condemned installation before repairs and approval have been made is an unlawful procedure. Electrical installations complying with regulations and made prior to the effective date of the Article are not affected unless they are found to be dangerous and a hazard to life and property.

The proposed plan will operate somewhat like this:

1. The inspection department will zone the entire city—each zone to be subdivided into sections and each section divided into blocks. Each building in the block will be numbered.
2. The name and address of the owner and principal tenant of each building will be kept on file.
3. Resurvey inspectors will be assigned sections, select blocks and start with Building No. 1 and inspect the wiring from roof to basement; the same will be done with other buildings.
4. The findings of the inspectors will be reported to the inspection department office.
5. Previously assigned experienced letter writers will mail letters disclosing the hazards and recommendations to the legal owners and principal occupants.

Although this appears to be complicated and unworkable, Los Angeles found it very simple, legal and feasible when it was in operation during the depression (1929–1934).

Prior to and shortly after Pearl Harbor, the City maintained a staff of resurvey inspectors to reinspect defense plants for the purpose of preventing work stoppage that might occur from fire, etc. However, it was discontinued due to the manpower shortage and increase in new permits (1492 in June 1943; 2776 in June 1944). Now, however, they have the large number of "emergency" installations good only for six months after the war to reinspect as well as others which should have been reinspected and corrected long ago. It is not the intention of this program to cause the removal of permanently concealed emergency installations nor, in some instances, exposed wiring unless indications point to tampering and overloading.

The electric utilities are able to cooperate with the city electrical inspection department since they maintain a standby charge for industrial loads based on connected horsepower. Where they find an appreciable increase in horsepower and have not received an inspection report, the city inspection department is notified and they take appropriate action. The Fire Prevention Detail of the Fire Department, when they find defective or hazardous wiring in the course of their inspections, also notify the city electrical inspection department in writing and action is then taken.

From a report on Reinspection presented by V. C. Moulton, Denver, Colo. at the Indianapolis meeting of the Western Section, I.A.E.I.

NECA Conference Report

Management, labor, manufacturer, wholesaler and utility representatives review coordinated electrical industry postwar activities at the 43rd Annual Meeting of the National Electrical Contractors Association, French Lick Springs Hotel, Oct. 1-6.

WITH a European victory imminent and American industry doing some serious thinking on the problems of reconversion and full employment in a peace-time economy, the National Electrical Contractors Association reviewed the possibilities of translating a coordinated electrical industry postwar program into action immediately after V-E day at their 43rd Annual Meeting in French Lick, Ind. Realizing the importance of cooperation in developing and capitalizing on the postwar electrical market, NECA brought official representatives of the International Brotherhood of Electrical Workers, National Electrical Manufacturers Association, National Electrical Wholesalers Association and the Edison Electric Institute to present the plans of their respective organizations to the more than 450 delegates and guests of the conference. Supplementing their reports was a resume of NECA'S own plans.

SUNDAY

At a pre-convention session of the new Board of Governors—the first meeting of the 55 direct representatives of the membership—a full agenda was reviewed. Among the actions taken were the following: endorsement of the NECA national advertising program to be inaugurated after a sufficient number of Chapters have obtained a second wage rate agreement (industrial maintenance) with their local IBEW unions; approval of the extension of standardized labor agreements between local Chapters and local Unions; approval of NECA publication of dues, assessments, wage rates, licensing and inspection requirements of the various Chapters.

Other Board actions charged the NECA Codes and Standards Committee to thoroughly study the question of bare neutral systems and make a report to the Administrative Committee for submission to a referendum vote; approved the extension of the NECA News Letter on a weekly basis; and conferred an honorary membership on Fred B. Adam, president Frank Adam Electric Company and a NECA member for 43 years.

MONDAY

In his annual report at the opening of the general sessions, NECA president Robert W. McChesney, reviewed the association's recent activities of planning and organizing to assure the electrical contractor his share of the enormous postwar electrical market—such plans now being ready to function. Continuing, he presented the following resume of organization activities:

Apprenticeship Training—The National Joint Apprenticeship Committee for the Electrical Industry has, in the comparatively short time allotted, completed "Standards" for over-all apprenticeship and training in the industry. The word "Construction" has been deleted from the Committee Title to be consistent with the proposed broad application of contractor services in the various phases of the electrical industry—such expanded services having been proved feasible during the war period.

Labor-Management Committee—Several recommendations of the NECA - IBEW Labor - Management Planning Committee, notably that of full time employment on an annual basis, have been jointly accepted and are now being promoted nationally. Since the largest immediate volume of future business lies in the conversion of industrial facilities to peace-time production and the rehabilitation of commercial and institutional electrical facilities, Mr. McChesney urged immediate approval and adoption of the NECA business promotional program designed to reach these vast postwar markets.

Field Service—The NECA Field Service Staff has been completed with a qualified full time representative operating in each of the six geographical divisions of the country. To reduce

forced idleness of electrical contractors due to dependence upon strictly construction work, NECA has resolved to prepare and equip its members to sell and perform all kinds and types of electrical service.

Government Regulations — NECA has partially won a long fight against MPR 251, by the recent release of a Revised MPR 251 which eliminates most of the objectionable phases. The Construction Industry Advisory Group of the Construction and Civic Development Department of the Chamber of Commerce of the United States is conferring and cooperating with the WPB to procure a relaxation of Limitation Order L-41. Indications are that some materials for the construction industry will be available at an early date and removal of the restrictive order might follow victory in Europe. Present WPB estimates indicate enough available materials for a construction volume of 4.25 billions in 1945 compared with 3.6 billions this year.

In his annual report to the convention, General Manager Laurence W. Davis reviewed the recent growth of NECA, noting that, despite a general housecleaning of more than 200 undependable members within the past 20 months, the roster now totals 1,120 members (a net gain of 217 active members) with 47 Chapters, embracing 853 of these. The jurisdiction of NECA Chapters is being extended to serve larger economic areas, he added, the eventual plan being to bring every area in the country within the jurisdiction of an active chapter.

Reviewing NECA's victory in securing the recently released RMPR-251, Mr. Davis went on to point out a provision that still seems dangerous —the authority of each Regional OPA Administrator to put into effect pricing orders establishing maximum prices for particular kinds, types or classifications of construction services or sales of installed business materials applicable to a particular community or a defined area. Should the application of this provision in any region impose unfair regulations, he urged the contractors to protest immediately. In the meantime, he urged members to give RMPR-251 a fair trial and seek to make it work. In concluding he asked contractors to keep reasonable records and adequate bookkeeping to provide a defense against any possible OPA charges of unfair pricing brought under this regulation.

With the Field Service staff completely organized (each of the six field representatives covering from 7 to 9 states) Paul M. Geary, Assistant General Manager and Field Supervisor, reported on the objectives of this NECA activity. These are:

1. To organize in every area an active local Joint Committee on Apprenticeship and Training to function under the Standards of the National Committee.

2. To have every NECA Chapter and appropriate IBEW Local Union acknowledge that there are other fields of activity open for contractors which provide a practical application of "full-time employment on an annual basis"; that the hourly labor cost should not be greater than that of any other type of employer for the same class of work on a regular employment basis.

1. W. V. Pangborne, W. V. Pangborne & Co., Inc., Philadelphia, A. H. "Doc" Keith, Westinghouse Elec. Supply Co., and Harry M. Schulman, A. S. Schulman Elec. Co., Chicago. 2. Robert W. McChesney, Washington, NECA President and Fred B. Adam, Frank Adam Electric Co., St. Louis. 3. A. F. Gould, Central Electric Co., Battle Creek; A. H. Wilson, President NECA Chapter, Washington, and J. W. Collins, Chicago NECA Chapter. 4. W. H. Biester, Jr., Electro Construction Co., Philadelphia; Allan Coggeshall, Hatzel & Buehler, New York; George Andrae, Herman Andrae Electric Co., Milwaukee, and T. W. Wilmer, Chewning & Wilmer, Richmond and D. B. Clayton, Birmingham. 5. Paul Heydon, Mgr., Spokane NECA Chapter; R. D. Horning, Mgr., NECA Chapter; Archie Morgan, Morgan Electric Co.; Grover C. Burke, City Electric & Fixture Co.; C. F. Meagher, all of Seattle.

FULL TIME EMPLOYMENT IS BASIC

By Robert W. McChesney for NECA

The electrical construction industry has resolved to avoid, if possible, the reoccurrence of the mass unemployment we experienced after the last war, so we started early to plan a program designed to create sufficient civilian business to replace that furnished by war production.

The Labor Management Planning Committee was jointly established by the National Electrical Contractors Association and the International Brotherhood of Electrical Workers, to study the problem insofar as it concerns our mutual interests and to make recommendations for adjustments necessary for the electrical contracting industry to meet the war and postwar conditions.

The most pertinent recommendation made and adopted by both organizations is full time employment on an annual basis at an hourly cost of less than that paid for intermittent employment such as is used for building construction.

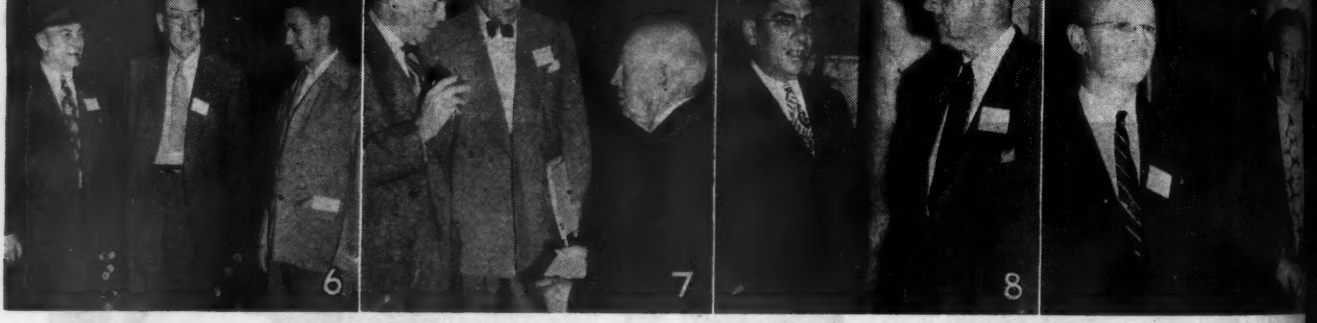
Another recommendation is that of overall apprenticeship and training in all kinds of electrical work, including inside construction, line construction, cable installation, industrial electronics, signal system, communication, power generation and distribution, railroad system, broadcasting rigging and welding, repairs and rewinding and all types of maintenance operations.

NECA has a business promotional program designed to reach the great postwar markets. This program consists of a national approach by NECA to sell its members as the electrical contractors best qualified to do all types of electrical work. We are ready for action.

that, by local committee action, apprentices be required to go to night school on their own time to acquire knowledge on subjects in which they are lacking, he added, stressing the importance of viewing Apprenticeship and Training from an *Educational* instead of a Production viewpoint.

Action was also taken to have a special committee on the NJATC seek General Hines' acceptance of the Standards for training returning service men. Joint approval was also given to the program of seeking contractor cooperation in reporting skill shortages to Local Joint Apprenticeship Committees—such shortages to be remedied by the NJATC.

On the subject of indenturing, Chairman Herzberg stated that the *most desirable* plan is to have the apprentice indentured by agreement to the Local Joint Committee and sub-indentured to



6. F. J. Groleau, Groleau Electric Co., Muskegon; A. J. Harmon, Harmon Electric Co., Chicago, and Charles H. Stark, Stark Electric Co., Baltimore. 7. A. Lincoln Bush, Belmont Electric Co., Paul Fitzpatrick, American Arbitration Association, and F. W. Lord, Lord Electric Co., all of New York City. 8. George L. Gamp, Gamp Electric Co., St. Louis, and S. J. O'Brien, S. J. O'Brien Sales Co., New York City. 9. J. H. Hennequin, Cincinnati Chapter NECA; and G. W. Archiable, Archiable Electric Co., Cincinnati.

3. To provide NECA headquarters with more complete and accurate information for Industry statistics.

4. To bring into the NECA fold at least the approximately 500 non-member electrical contractors with an annual volume in excess of $25,000.

5. By establishing additional Chapters and extending the jurisdiction of existing ones, to bring all NECA members throughout the country into and under the jurisdiction of a NECA Chapter.

6. To establish a reasonable degree of uniformity of local Chapter By-Laws, operating procedure, and a standardized labor agreement between Chapters and Local Unions.

7. To assist Chapters in securing passage of desirable local and state legislation.

8. To establish the necessary cooperation and recognition of and compensation for services rendered by electrical contractors in the distribution of electrical materials and equipment.

9. To prove to potential customers that electrical work of any nature can be done more economically and expeditiously by an electrical contractor with his skilled personnel.

Reporting on Over-All Apprenticeship and Training, E. H. Herzberg, chairman, National Joint Apprenticeship Committee for the Electrical Industry, revealed that at a formal meeting in Chicago on Sept. 9, the Committee adopted an amended version of the tentative draft of the Standards, thereby creating the National Apprenticeship and Training Standards for the Electrical Industry which will be printed in the near future and amended from time to time by the Committee as experience dictates. The Committee also supported a recommendation that the individual employer, thus placing directly on the Committee the responsibility of providing the apprentice with a well rounded training in all phases of the electrical field. Mr. Herzberg, in concluding, urged the prompt acceptance and adoption of the Standards—an action which was taken at the business session.

The activity of the Chamber of Commerce of the United States in coordinating the Construction Industry, was reviewed by F. Stuart Fitzpatrick, Manager, Construction and Civic Development Department, Chamber of Commerce of the United States. Outlining the organization and operation of the Construction Advisory Group of this Department, he revealed that they are dealing effectively with the construction industry's over-all conversion problems; that they are providing constructive and informed advice to WPB

officials in determining what action should be taken with costruction controls after V-E day. WPB has been convinced, he added, that early and prompt removal of all construction controls, except those necessary for the military, is required for rapid resumption of civilian employment in the conversion period and that anticipated improvement in the materials situation makes this entirely feasible.

Noting that many construction industry problems are local in nature, he urged the use of local Chambers of Commerce who are in a position to help solve them through activities such as surveys of demand for construction, modernization of building codes and apprentice training. Construction is the basic activity in our economy and its organization and maintenance of reasonable stability are important to the entire economy, he added, concluding that the coordinating facilities of the Chamber of Commerce are available—and are being utilized by the construction industry.

TUESDAY

The postwar thinking of the major branches of the electrical industry—contractors, manufacturers, wholesalers and utility—was marshaled into a single session to pose the possibilities of coordinating plans to reach the vast postwar market that victory will unleash. A common link between all plans was the goal of full employment as a national objective and the creation of sufficient civilian business to replace a large portion of the present wartime capacity. The plans, as presented by official representatives of the National Electrical Contractors Association, the National Electrical Manufacturers Association, the National Electrical Wholesalers Association and the Edison Electric Institute, are briefed below.

The NECA Program—(R. W. McChesney, president)—Based on recommendations of the NECA-IBEW Labor-Management Planning Committee, the following plans were evolved to extend the services of the electrical contractor and remove his full dependency on construction as a sole livelihood:

1. Full time employment on an annual basis at an hourly cost less than that for intermittent employment. Although hourly wages may always be necessary in the construction field, other activities such as maintenance, repairs, etc., make full time employment feasible.

2. Extension of apprenticeship and training to include all types of electrical work. New Standards have now been formed for inside construction, line construction, cable installations, industrial electronics, signal systems, telegraph and telephone communications, light and power generation and distribution systems, railroad systems, radio broadcasting, rigging and welding, repairs and rewinding, and all types of maintenance and operation.

3. Adoption of a broad national and local business promotion program to sell the services of the electrical contractor in soliciting millions of dollars worth of work in industrial plants, shipbuilding and repair yards, commercial organizations, institutions, utilities and other markets.

4. The reorganization of NECA and completion of the Field Service Staff (both already accomplished) to assist local chapters and cooperate with other branches of the industry in the development of electrical markets.

10. W. T. Drury, Drury Electric Company, Bakers Field, and T. L. Rosenberg, T. L. Rosenberg Company, Oakland. 11. J. C. Kochis, Kochis Electric Company, Struthers, and E. C. Carlson, Carlson Electric Company, Youngstown. 12. W. W. Hanks, Southern Electric Service Company, Inc., Charlotte, and Fred A. Rick, Rick Electric Company, St. Louis. 13. G. V. "Denny" Dameron, Manager, Greater Kansas City Chapter NECA Kansas City, and G. G. Burkholder, Burkholder Electric Company, Kansas City.

COORDINATION IS VITAL

By A. C. Streamer for NEMA

Coordination of effort by the four associations is most important as V-day approaches. Among the activities of the National Electrical Manufacturers Association is the promotion of sales including the Adequate Wiring Program, Electric Range Promotion, Electric Water Heating, the International Electronics Exposition, What's Ahead in Street Lighting and the program of the Industrial and Commercial Lighting Equipment Section.

Probably no other NEMA activity is of more direct interest to contractors than the National Adequate Wiring Bureau. NECA is a joint sponsor with the four other major branches of the industry. Adequate wiring is the key to greater employment and more business for electrical contractors. Local electrical industry organizations are carrying the ball now. When restrictions on home construction are lifted, the ball will be passed to you contractors for the touchdown which will bring you your share of the business that is bound to result from aggressive action now.

The range program is stressing the reason why architects and builders must provide adequate service entrances and range circuits to make new homes salable. These programs promoted by the Electric Range Section make business for electrical contractors and deserve their active support.

In lighting, a tremendous market will be available and everything possible must be done to encourage it. Two broad programs are at work, one in street lighting and the second in industrial and commercial lighting.

WE MUST WORK TOGETHER

By J. L. Busey for NEWA

One conclusion of our Postwar Planning Committee is that the use of electricity will increase enormously. A large increase is anticipated in use by industrial plants, commercials, transportation, communication and a greatly increased use on the farm and in the house. Many new uses will be devised and made available to our customers through planning and action on our part.

Electrical wholesale distributors are preparing to improve the efficiency of their individual operations to the end that their prices shall reflect the lowest possible cost of wholesale distribution and provide a better, more specialized service on new and old products.

We propose to find, train and make efficient use of more lighting engineers, to equip technical specialists to assist you in your selling job. Progressive distributors who engage in this program are confident of your support. It is not their intention to do your selling job or direct your business activities. We hope you will effectively utilize the specialized services that will be available and cooperate with us in this mutual sales job.

The success of our planning may depend largely on how well we are able to work together. With a minimum of planning but a maximum of cooperation, manufacturers, wholesalers and contractors have helped to win a war. As we continue working together toward the final victory we know that the same spirit of cooperation will take us through the confusion of reconversion and into the postwar period ready to cash in on opportunities presented.

14. Fred H. Stewart, Stewart Electric Co., Miami; Charles H. Whitehead, Whitehead Electric Co., Atlanta; H. G. Miller, Miller Electric Co., Jacksonville; and Robert C. Bigby, Bigby Electric Co., Tampa. 15. Mrs. W. E. Frazer, Philadelphia; D. B. Clayton, Birmingham; Mrs. L. W. Davis, Washington; Mrs. C. B. Kenney, San Francisco; Mrs. D. B. Clayton, Birmingham; and (standing) Mrs. Clyde Chamblin, San Francisco. 16. August G. Ofenstein, Ofenstein Engineering Co, Detroit; C. C. Cadwallader, Secretary, Detroit Chapter NECA; F. J. Groleau, Groleau Electric Co., Muskegon; (Standing) Lester F. Brooker, Brooker Engineering Co., Detroit; L. C. Reicher, National Electric Products Co., Detroit; and Bud Fowler, Barker-Fowler Electric Co., Lansing.

The NEMA Program — (A. C. Streamer, vice-president)—Since one of NEMA's most important activities and responsibilities is the promotion of sales of its members' products and market analyses to aid and guide such promotion, Mr. Streamer outlined in detail six definite programs.

1. Adequate Wiring designed to build postwar wiring business. Wiring in the "certified" adequate wired home of tomorrow represents from 80 to 100 percent more dollars than the conventional job of the past and will require at least eleven more man hours. Of America's 32 million existing wired homes, 95 percent contain insufficient wiring to care for existing loads. The 1945 plans of the National Adequate Wiring Bureau incorporates an extensive promotional program including a plan book and promotional material for builders, home financing groups, home economic instructors and local industry groups as well as display at the National Association of Home Builders Exhibit in Chicago in January 1945.

2. The prewar Electric Range Promotional Program will be supplemented by (a) an educational program for Home Economic teachers and students and (2) an architects and builders program.

3. The resumption and expansion of the Electric Water Heater Program.

4. The International Electronics Exposition in late 1945—working exhibits and demonstrations of electronic principles with technical clinics—showing the use of electronics in industry.

5. Two broad lighting sales programs—one on street lighting and the other on industrial and commercial lighting. Supplementing these will be the development of a Marketing Manual; a Lighting Layout Guide giving specific recommendations and performance charts (a supplement to the American Recommended Practice of Industrial Lighting); and the International Lighting Exposition in Chicago, April 19-23, 1945—a combination exhibit and technical clinic.

The NEWA Program — (J. L. Busey, president)—The Wholesaler's postwar objective is to increase and improve the use of electricity in the Industrial, Commercial, Rural-Farm and Residential markets and maintenance of close cooperation with the Adequate Wiring Bureau activities. In this respect they plan to:

1. Improve the efficiency of their individual operations to reflect the lowest possible distribution cost.

2. Provide better and more specialized services on new and old products.

3. Hire, train and make efficient use of more lighting engineers and technical specialists to assist in the mutual selling job.

4. In line with a full employment goal to work out a placement program for returning service men.

The EEI Program—(M. E. Skinner, chairman, Commercial Planning Committee)—Acknowledging the sales potential accompanying ideas that have become a part of American life, Mr. Skinner outlined the Edison Electric Institute plan of Electrical Living—a single package program marshaling all phases of the industry to sell the public the idea of Electrical Living. Using the Adequate Wiring activity as a basis, this plan—aimed at the new

home and home modernization market —will incorporate specifications for:

1. A complete electric kitchen.
2. Fixed lighting equipment.
3. Laundry equipment.
4. Air conditioning as suited to community climatic conditions.

This four-star plan will also incorporate inspection, certification, and labeling service to indicate the home is wired and equipped to conform to such specifications—one star to be added to a banner for each feature beyond adequate wiring. The program will provide an opportunity for team work between the major electrical industry branches to attain the postwar goal of electrical living in every home.

WEDNESDAY

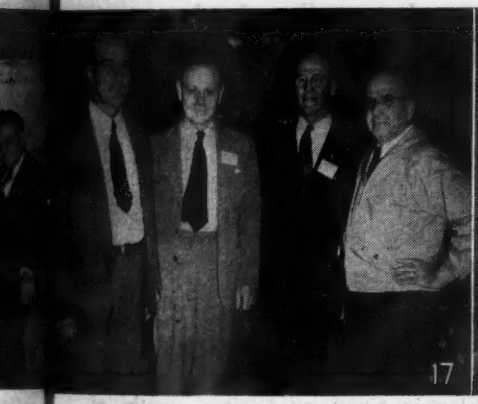
The thread of postwar thinking was continued into the third session of the conference in which labor's plans, contract arbitration and industrial and commercial business promotion were reviewed.

Opening the third day's session, W. A. Cyr, secretary, Northern California Chapter, NECA, read a paper prepared by Walter J. Walsh, attorney for the San Francisco Electrical Contractors Association, Inc. He reviewed the significance of the California Contractor's recent victory over a Thurman Arnold indictment on Dec. 29, 1939, of the electrical contractors of San Francisco, Alameda and Contra Costa Counties and two local Unions of IBEW. The indictment pictured the Electrical Industry Depository of California—a bid depository—as "an unlawful combination and conspiracy to . . . increase, regulate, fix, dictate and control bids of electrical contractors submitted to general contractors . . . to eliminate contractors refusing to participate . . . to increase cost of and restrict volume electrical equipment shipped in interstate commerce into the San Francisco Bay area."

The significant part of Judge Yankwich's decision in favor of the contractors was his view that there was no continuity of flow in interstate commerce and that "the electrical contractor does not buy articles in interstate commerce for resale . . . but for his own use in building electrical systems. When he bids a job, he agrees to install an electrical system. His charges are for the completed system. Into the making of his price go electrical articles, cost of labor of others, his own engineering skill in installing the various parts and combining them into a working whole, his own cost of doing business, and his profits of management." This decision makes it clear that a lawful agreement between the contractors and labor relative to the conditions of the industry cannot be disturbed by the anti-trust division of the Federal Government, Attorney Walsh concludes. The convention in a rising vote of gratitude commended the California contractors for their fortitude in their five-year fight and final victory.

Pinch-hitting for E. J. Brown, president, IBEW, Edward Bieretz, assistant to Mr. Brown, cautioned the contractors against the fallacy of making postwar plans without acknowledging the work involved in executing them. Stating that Labor's position always has been to contribute to progress in the electrical industry, he highlighted IBEW's postwar plans as a promotion of efficiency among its members and cited the recently organized IBEW electronics course at Marquette Uni-

[Continued on page 188]



17. John Wetzig, Business Manager, Local 124, IBEW; Marshall Havenhill, Kansas City Power and Light Co.; Harry Evans, Evans Electric Co., and Fred E. Geiss, Fred E. Geiss Electric Co., all of Kansas City. 18. C. J. Schwab, Buffalo Electric Co.; Wm. P. Fisher, Bus. Mgr., Local 41, IBEW; George F. Butler, Beacon Electric Engineering and Construction Co.; Whitworth Ferguson, Ferguson Electrical Construction Co., Buffalo. 19. Mrs. E. C. Carlson, Youngstown; J. C. Kochis and Mrs. J. C. Kochis, Struthers.

PLAN FOR ELECTRIC LIVING

By M. E. Skinner for EEI

The Edison Electric Institute plan of electrical living is a single package program designed to marshall all phases of the electrical industry. The Electrical Living Plan uses the adequate wiring program as a base but goes beyond the wiring stage and may incorporate specifications for 1) complete electric kitchen, 2) fixed lighting equipment, 3) laundry equipment and 4) air conditioning equipment suited to community climatic conditions.

Electrical Living is a flexible plan readily adaptable to local conditions. It incorporates inspection, certification and labeling service to indicate homes which have been wired and equipped to conform with the living plan specifications. Each feature is indicated by a star on the identifying banner and symbol, thus the more stars the more complete the electrical living features of the home. The stars are added at the discretion of local organizations. In some areas a two star program may be the best immediate goal, in others the program may embrace five or more electrical equipment features.

With adequate wiring the common denominator of the plan over the country, it provides an opportunity for extensive team work in the major industry branches to attain the goal of electrical living. Electrical contractors can lead in the promotion of the plan and with it as a nucleus for all industry effort, leagues, manufacturers and others should tie in the advantages of electrical living in all advertising and promotional activities.

WE MUST WORK TOGETHER

By J. L. Busey for NEWA

One conclusion of our Postwar Planning Committee is that the use of electricity will increase enormously. A large increase is anticipated in use by industrial plants, commercials, transportation, communication and a greatly increased use on the farm and in the house. Many new uses will be devised and made available to our customers through planning and action on our part.

Electrical wholesale distributors are preparing to improve the efficiency of their individual operations to the end that their prices shall reflect the lowest possible cost of wholesale distribution and provide a better, more specialized service on new and old products.

We propose to find, train and make efficient use of more lighting engineers, to equip technical specialists to assist you in your selling job. Progressive distributors who engage in this program are confident of your support. It is not their intention to do your selling job or direct your business activities. We hope you will effectively utilize the specialized services that will be available and cooperate with us in this mutual sales job.

The success of our planning may depend largely on how well we are able to work together. With a minimum of planning but a maximum of cooperation, manufacturers, wholesalers and contractors have helped to win a war. As we continue working together toward the final victory we know that the same spirit of cooperation will take us through the confusion of reconversion and into the postwar period ready to cash in on opportunities presented.

grams—one on street lighting and the other on industrial and commercial lighting. Supplementing these will be the development of a Marketing Manual; a Lighting Layout Guide giving specific recommendations and performance charts (a supplement to the American Recommended Practice of Industrial Lighting); and the International Lighting Exposition in Chicago, April 19-23, 1945—a combination exhibit and technical clinic.

The NEWA Program — (J. L. Busey, president)—The Wholesaler's postwar objective is to increase and improve the use of electricity in the Industrial, Commercial, Rural-Farm and Residential markets and maintenance of close cooperation with the Adequate Wiring Bureau activities. In this respect they plan to:

1. Improve the efficiency of their individual operations to reflect the lowest possible distribution cost.

14. Fred H. Stewart, Stewart Electric Co., Miami; Charles H. Whitehead, Whitehead Electric Co., Atlanta; H. G. Miller, Miller Electric Co., Jacksonville; and Robert C. Bigby, Bigby Electric Co., Tampa. 15. Mrs. W. E. Frazer, Philadelphia; D. B. Clayton, Birmingham; Mrs. L. W. Davis, Washington; Mrs. C. B. Kenney, San Francisco; Mrs. D. B. Clayton, Birmingham; and (standing) Mrs. Clyde Chamblin, San Francisco. 16. August G. Ofenstein, Ofenstein Engineering Co, Detroit; C. C. Cadwallader, Secretary, Detroit Chapter NECA; F. J. Groleau, Groleau Electric Co., Muskegon; (Standing) Lester F. Brooker, Brooker Engineering Co., Detroit; L. C. Reicher, National Electric Products Co., Detroit; and Bud Fowler, Barker-Fowler Electric Co., Lansing.

The NEMA Program — (A. C. Streamer, vice-president)—Since one of NEMA's most important activities and responsibilities is the promotion of sales of its members' products and market analyses to aid and guide such promotion, Mr. Streamer outlined in detail six definite programs.

1. Adequate Wiring designed to build postwar wiring business. Wiring in the "certified" adequate wired home of tomorrow represents from 80 to 100 percent more dollars than the conventional job of the past and will require at least eleven more man hours. Of America's 32 million existing wired homes, 95 percent contain insufficient wiring to care for existing loads. The 1945 plans of the National Adequate Wiring Bureau incorporates an extensive promotional program including a plan book and promotional material for builders, home financing groups, home economic instructors and local industry groups as well as display at the National Association of Home Builders Exhibit in Chicago in January 1945.

2. The prewar Electric Range Promotional Program will be supplemented by (a) an educational program for Home Economic teachers and students and (2) an architects and builders program.

3. The resumption and expansion of the Electric Water Heater Program.

4. The International Electronics Exposition in late 1945—working exhibits and demonstrations of electronic principles with technical clinics—showing the use of electronics in industry.

5. Two broad lighting sales pro-

2. Provide better and more specialized services on new and old products.

3. Hire, train and make efficient use of more lighting engineers and technical specialists to assist in the mutual selling job.

4. In line with a full employment goal to work out a placement program for returning service men.

The EEI Program—(M. E. Skinner, chairman, Commercial Planning Committee)—Acknowledging the sales potential accompanying ideas that have become a part of American life, Mr. Skinner outlined the Edison Electric Institute plan of Electrical Living—a single package program marshaling all phases of the industry to sell the public the idea of Electrical Living. Using the Adequate Wiring activity as a basis, this plan—aimed at the new

home and home modernization market —will incorporate specifications for:

1. A complete electric kitchen.
2. Fixed lighting equipment.
3. Laundry equipment.
4. Air conditioning as suited to community climatic conditions.

This four-star plan will also incorporate inspection, certification, and labeling service to indicate the home is wired and equipped to conform to such specifications—one star to be added to a banner for each feature beyond adequate wiring. The program will provide an opportunity for team work between the major electrical industry branches to attain the postwar goal of electrical living in every home.

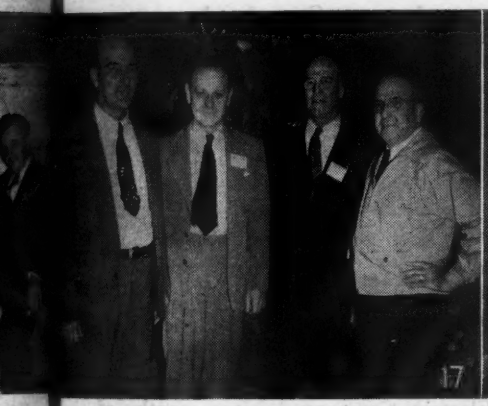
WEDNESDAY

The thread of postwar thinking was continued into the third session of the conference in which labor's plans, contractors submitted to general contractors . . . to eliminate contractors refusing to participate . . . to increase cost of and restrict volume electrical equipment shipped in interstate commerce into the San Francisco Bay area."

The significant part of Judge Yankwich's decision in favor of the contractors was his view that there was no continuity of flow in interstate commerce and that "the electrical contractor does not buy articles in interstate commerce for resale . . . but for his own use in building electrical systems. When he bids a job, he agrees to install an electrical system. His charges are for the completed system. Into the making of his price go electrical articles, cost of labor of others, his own engineering skill in installing the various parts and combining them into a working whole, his own cost of doing business, and his profits of management." This decision makes it clear that a lawful agreement between the contractors and labor relative to the conditions of the industry cannot be disturbed by the anti-trust division of the Federal Government, Attorney Walsh concludes. The convention in a rising vote of gratitude commended the California contractors for their fortitude in their five-year fight and final victory.

Pinch-hitting for E. J. Brown, president, IBEW, Edward Bieretz, assistant to Mr. Brown, cautioned the contractors against the fallacy of making postwar plans without acknowledging the work involved in executing them. Stating that Labor's position always has been to contribute to progress in the electrical industry, he highlighted IBEW's postwar plans as a promotion of efficiency among its members and cited the recently organized IBEW electronics course at Marquette Uni-

[Continued on page 188]



17. John Wetzig, Business Manager, Local 124, IBEW; Marshall Havenhill, Kansas City Power and Light Co.; Harry Evans, Evans Electric Co., and Fred E. Geiss, Fred E. Geiss Electric Co., all of Kansas City. 18. C. J. Schwab, Buffalo Electric Co.; Wm. P. Fisher, Bus. Mgr., Local 41, IBEW; George F. Butler, Beacon Electric Engineering and Construction Co.; Whitworth Ferguson, Ferguson Electrical Construction Co., Buffalo. 19. Mrs. E. C. Carlson, Youngstown; J. C. Kochis and Mrs. J. C. Kochis, Struthers.

tract arbitration and industrial and commercial business promotion were reviewed.

Opening the third day's session, W. A. Cyr, secretary, Northern California Chapter, NECA, read a paper prepared by Walter J. Walsh, attorney for the San Francisco Electrical Contractors Association, Inc. He reviewed the significance of the California Contractor's recent victory over a Thurman Arnold indictment on Dec. 29, 1939, of the electrical contractors of San Francisco, Alameda and Contra Costa Counties and two local Unions of IBEW. The indictment pictured the Electrical Industry Depository of California—a bid depository—as "an unlawful combination and conspiracy to . . . increase, regulate, fix, dictate and control bids of electrical contract-

PLAN FOR ELECTRIC LIVING

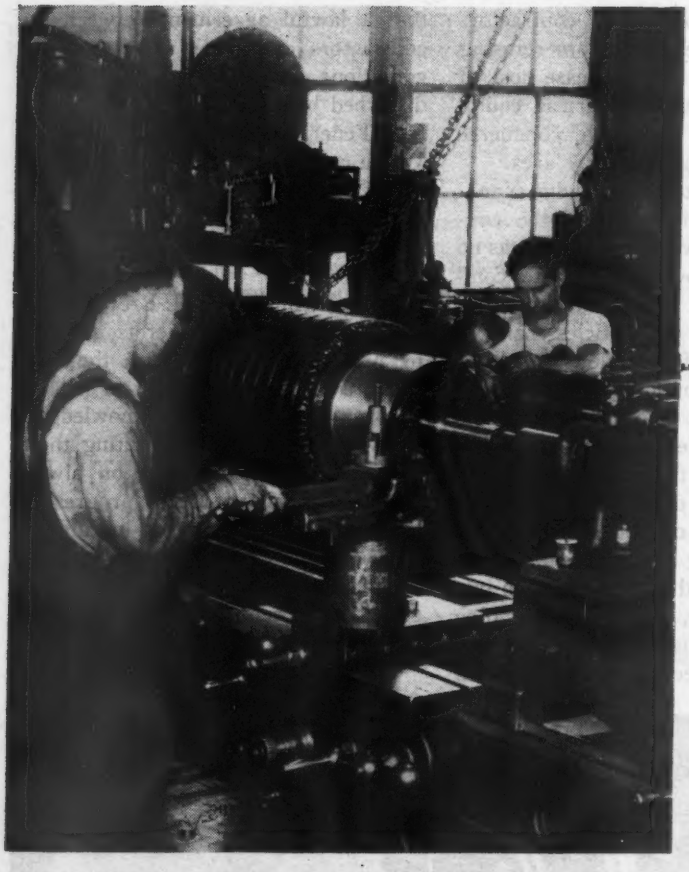
By M. E. Skinner for EEI

The Edison Electric Institute plan of electrical living is a single package program designed to marshall all phases of the electrical industry. The Electrical Living Plan uses the adequate wiring program as a base but goes beyond the wiring stage and may incorporate specifications for 1) complete electric kitchen, 2) fixed lighting equipment, 3) laundry equipment and 4) air conditioning equipment suited to community climatic conditions.

Electrical Living is a flexible plan readily adaptable to local conditions. It incorporates inspection, certification and labeling service to indicate homes which have been wired and equipped to conform with the living plan specifications. Each feature is indicated by a star on the identifying banner and symbol, thus the more stars the more complete the electrical living features of the home. The stars are added at the discretion of local organizations. In some areas a two star program may be the best immediate goal, in others the program may embrace five or more electrical equipment features.

With adequate wiring the common denominator of the plan over the country, it provides an opportunity for extensive team work in the major industry branches to attain the goal of electrical living. Electrical contractors can lead in the promotion of the plan and with it as a nucleus for all industry effort, leagues, manufacturers and others should tie in the advantages of electrical living in all advertising and promotional activities.

REBUILT Electrical



Twenty-six definite specifications which rebuilt electrical equipment must meet before it leaves the shops of Central District Chapter, NISA (Chicago) members. Standards are now under consideration for adoption on a national basis.

***ACCURATELY MACHINED COMMUTATORS** provide better brush contact, longer brush wear and reduces sparking—another "must" for A-1 rebuilt machines.*

FOR some time members of the Central District Chapter, NISA—a group of Chicago area electric motor repair shops—had been toying with the idea of formulating some type of standards for the repair of electrical equipment. Equipment coming into their shops for repair, or through trade or direct purchase, was frequently devoid of nameplate, terminal boxes, leads; had poorly fitted bearings etc.,—all evidence of a dire need for some action to assure the customer or dealer of a more acceptable and more dependable electrical and mechanical piece of equipment properly represented as rebuilt or overhauled.

A committee was appointed to draw up a comprehensive set of specifications for presentation for Chapter action. Members upon whom this laborious task fell were Joe Ferrari (chairman), Excel Electric Service Co.; Arthur Wagner, Sr., Arthur Wagner Co.; Garrett Lea, Lea Electrical Equipment Co.; and Robert C. Kaska, Chicago Electric Company. After months of rehashing, a set of standards was placed before the Chapter, and adopted as the yard stick by which members would recognize an A-1 rebuilt job.

Presentation of the Central District

***THOROUGH CLEANING** of all windings and parts is an important feature of an A-1 reconditioning job.*

***FREEDOM FROM SHORT** circuits is assured by carefully insulated coils and slots.*

Equipment Standards

Chapter Standards to the NISA War Conference in Cincinnati by Charles Kaska (Chapter President) aroused the interest of the NISA National Certification Board as to the possibilities of formulating a set of National Motor Rebuilding Standards. Joe Ferrari was appointed chairman of the National Committee and is now receiving comments from the various NISA Chapters throughout the country who are reviewing the Chicago Standards.

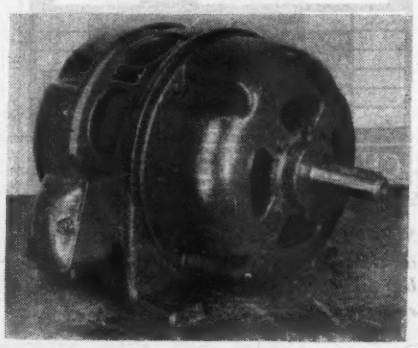
As adopted by the Central District Chapter and presented to the national NISA headquarters, the Chicago Standards under the title "A Guide For The Rebuilding of Electrical Equipment" embody the following specifications:

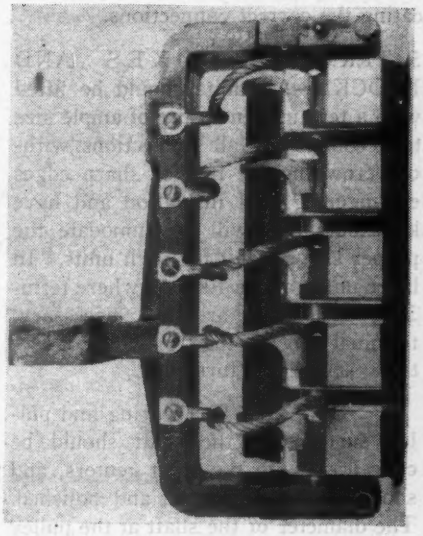
General

1. NAMEPLATE—Every piece of electrical equipment, such as motor, generator, convertor, starter, controller, transformer, etc., should have a permanent nameplate clearly and completely specifying all the necessary information—capacity amperes, voltage, (both primary and secondary), phase, frequency, full load current, rpm, and (wherever possible) frame size, type, continuous or intermittent duty, temperature rise, and original manufacturer's name and serial number.

2. CLEANING AND VARNISHING—All windings and parts, both external and internal, housings and bearings, should be thoroughly washed and cleaned free from dirt, grit, and grease. After being thoroughly dried the windings should be well varnished with a good grade of either air-drying or baking, moisture and oilproof varnish.

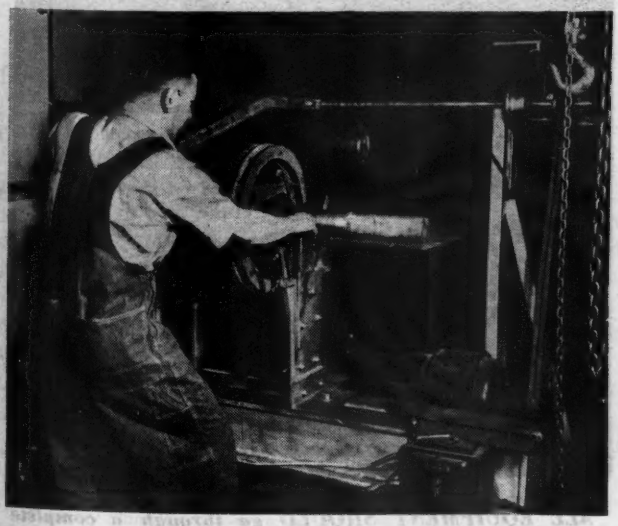
3. FRAMES AND BONNETS—All frames and bonnet castings shall be





***BRUSH HOLDERS** should be thoroughly cleaned, equipped with adjustable brush tension devices and the correct size and grade of brush for the specific motor.*

***REBUILT MOTORS** should reflect a first-class mechanical and electrical job. Units should be equipped with terminal boxes or connection blocks, keyways, have the frame newly painted and be ready for immediate service.*



***DYNAMIC BALANCING** assures smooth vibrationless operation of the reconditioned motor, when assembled.*

***WINDINGS SHOULD BE** well impregnated and baked; then connections and leads varnished.*

free from cracks and breaks, and the seats of the bonnets shall fit properly and squarely in the frame recess.

4. LEADS—All external and movable internal leads shall be flexible and in good condition and of sufficient length to permit ready connection to line wires. On d.c. equipment, dual voltage, and multiple winding motors, and on all controllers, transformers, and grids: all terminals and leads should be properly marked or tagged. In addition, a legible print or plate should be furnished or attached, indicating the correct connections.

5. TERMINAL BOXES AND BLOCKS—All units should be fitted with a terminal enclosure of ample size to accommodate all connections without crowding, be free of sharp edges endangering lead insulation and have knockouts that will accommodate the proper size conduit for such units. In large units, above 100 hp., where terminal enclosures are not necessary, terminal blocks, lugs or bus connections should be furnished.

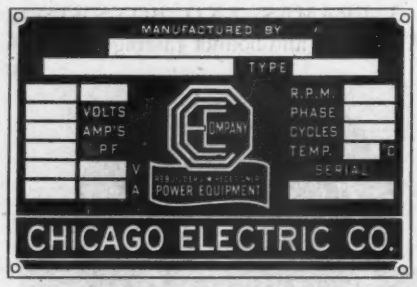
6. SHAFTS—The bearing and pulley surfaces of the shaft should be concentric with the shaft centers, and should be true, smooth, and polished. The diameter of the shaft at the pulley portion should not be more than 10 percent smaller than the NEMA size shaft for same size motor of corresponding horse power and speed, and should not be smaller than 1/10 of 1 percent from such standard diameters. (*Example*—A 1-in. shaft may be turned to $\frac{15}{16}$-in. and should not be smaller than .001-in. under $\frac{15}{16}$-in. A 2-in. shaft may be turned to $1\frac{7}{8}$-in. and be not less than .002-in. under $1\frac{7}{8}$-in.

Shafts not long enough to accommodate a pulley should be admitted to be a short shaft motor, and customer advised of same.

7. KEYWAYS—Keyways should be true, and have straight sides, and accommodate key steel to tap fit. When keyways are cut they should be made standard in dimensions, if possible.

8. SLEEVE BEARINGS—Sleeve bearings should be uniform in diameter, be of tap or press fit in the housing, and be smooth internally with oil grooves for proper distribution of oil. There should not be a difference in size between the bore of the bearing and the size of the shaft of more than $\frac{1}{2}$ of 1 percent of the shaft diameter. (*Example*—When a shaft is 1-in. in diameter, the inside diameter of bearing should not be larger than 1.005-in.; if the shaft is 0.95-in., the I. D. of the bearings should be not more than 1-in. On a 2-in. shaft, the I.D. of the bearings should be not more than 2.010-in.)

9. OIL RINGS—Oil rings should be perfectly true and be free from imperfections to the extent that same will rotate properly.



NAMEPLATE carrying complete information about the equipment should be on each unit before it leaves the repair shop.

10. BALL BEARINGS—Ball bearings should be free from play, and audible grating, rumbling, and knocking noises. Ball bearings should be of tap fit on the shaft, a push fit in the housing, and should be properly greased when installed in the motor.

11. BEARING HOUSINGS — The oiling system and oil and grease chambers should be cleaned, and protected from dirt by proper, well-fitted oil covers and end caps, and free from leaks. They should be equipped with a proper oil overflow cup, with cover, and of sufficient height to maintain correct oil level in bearing housing.

12. BALANCE—All rotors and armatures shall be either statically or dynamically balanced so as to produce smooth and vibrationless operation of the machine.

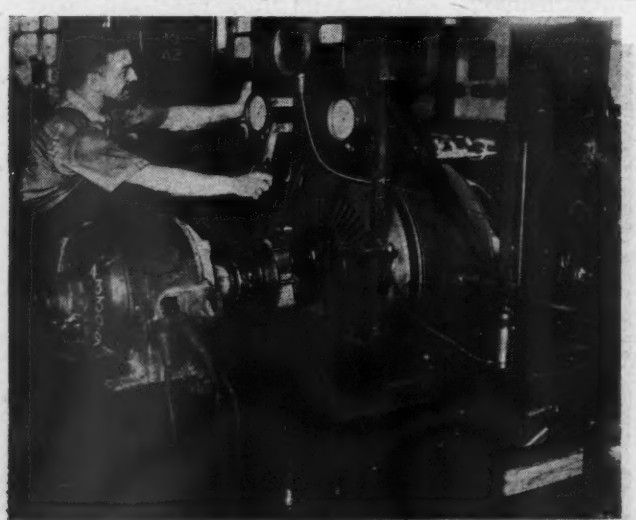
13. END THRUST—All rotors and armatures should be so centralized laterally on the shaft so as to overcome end thrust pressure against either bearing, and should float between bearings.

14. END PLAY—End play motion in motors should not be more than $\frac{1}{16}$-in. per inch diameter of shaft.

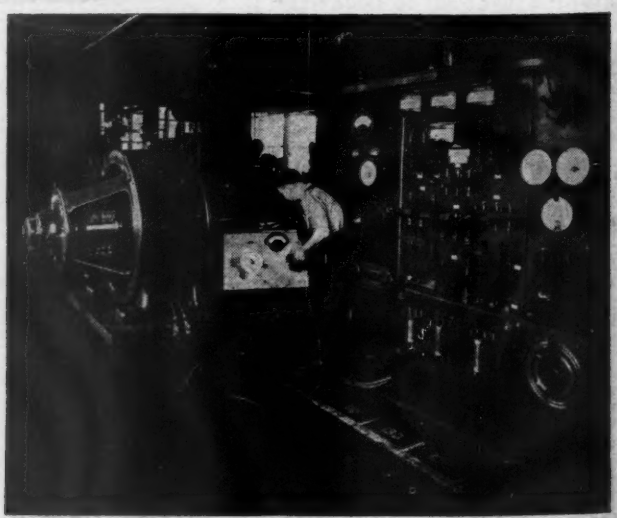
Mechanical and Electrical Details

15. A-C STATORS AND D-C POLE PIECES — *Mechanical* — All stator cores should be solid and a tight pressed fit in motor frames; all slots should be straight and regular. Direct current pole pieces must be solid and secure.

[Continued on page 64]

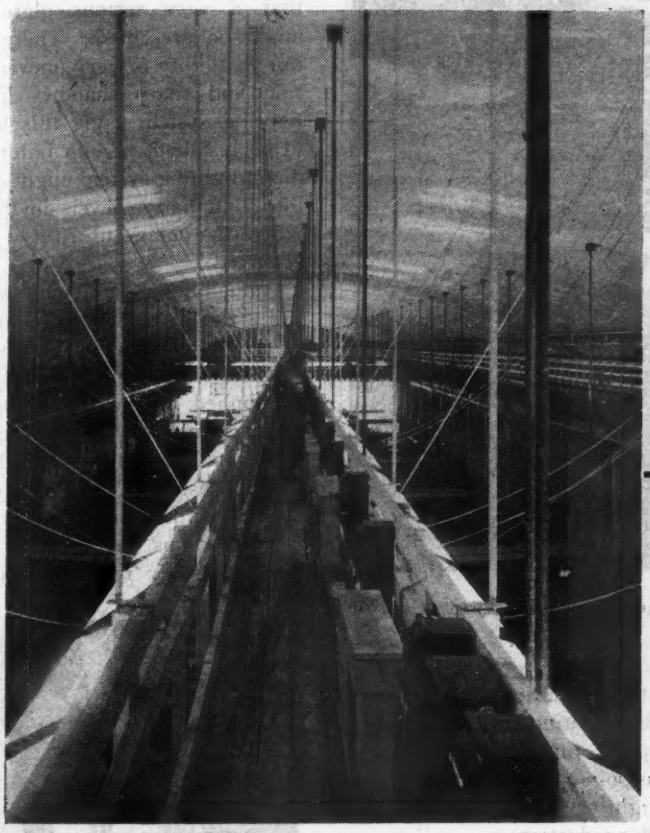


ABSORPTION DYNAMOMETER TESTS check reconditioned motors under actual load conditions, revealing any defects before motor leaves shop.



ALL EQUIPMENT SHOULD go through a complete series of tests to assure efficient operation and compliance with stated specifications.

Totally Indirect Industrial Lighting



Three thousand watt units, alternately mercury and incandescent, provide thirty maintained foot-candles at Budd Field plant.

By
J. L. Kilpatrick
and
L. N. Blugerman

***TRANSFORMERS** for the mercury units and safety switches are mounted against side rail of cat-walk. Wiring gutter runs on walk beneath equipment.*

THE tremendous open areas, clear of all structural interference required for large plane assembly at the Edward G. Budd plant near Philadelphia, created many engineering problems in plant construction. The physical problem of locating fixtures to meet the requirements of adequate illumination and maintenance proved one of the more difficult. After detailed studies of five separate lighting systems, indirect 3 kw. mercury units were selected to illuminate the assembly areas.

The completed structure was made of steel-reinforced concrete nearly 600 feet wide and 1800 feet long. The entire assembly area is all on one floor, its walls enclose over 24 acres of ground. In plan the area consists of two sections each approximately 135 ft. by 1800 ft. (designated "high bays") and six sections each approximately 50 ft. by 1800 ft. (designated "low bays"). Each bay was a vaulted roof made up of a compound curve which gives an appearance of a somewhat flattened section of a cylinder with a ceiling of smooth concrete. The vaulted ceilings have no beams or other obstructions with the exception of two rows of skylights in the large bays and one row of skylights in the small bays, together with suspension rods to support craneways and a Monorail system throughout the entire plant.

Stated in simple terms, the illumination problem was "to provide not less than 35 foot-candles maintained of adequate lighting." In the case under consideration, the following items had to be reviewed:

1. The Budd product was to be made of stainless steel. This indicated the presence of large surfaces of fairly high specularity in nearly all assembly operations. Such surfaces would pro-

**From a paper presented by J. L. Kilpatrick, Illuminating Engineer, Westinghouse Electric and Mfg. Co., Bloomfield, N. J. and L. N. Blugerman, Plant Engineer, Budd Assembly Plant, Bustleton, Pa., at the 37th annual meeting of the Illuminating Engineering Society.*

***GENERAL VIEW** of assembly area. Catwalk and line of fixtures can be seen at upper right between mono-rails.*

vide a potential source of reflected glare.

2. Certain assembled sections were to be so high that workers in some operations would be in close proximity to any lighting system installed. This necessitated consideration of direct glare. With this condition there was also the factor of heat radiation which required study.

3. Broad horizontal surfaces suggested the possibility of large shadow areas which would probably produce poor see-ability.

4. The use of many high jigs and other fixtures necessary for the assembly process emphasized the need of providing very well diffused illumination.

5. While it was recognized that in certain cases supplementary lighting would be necessary, it was desired to confine such local lighting to a minimum.

6. Ease of maintenance was of major importance. The complexity of jigs in certain areas made servicing from the floor impossible. Investigations into the experiences of other war plants emphasized the difficulties and high cost of maintaining lighting systems. In many cases reports on other existing installations pointed to the fact that servicing of lighting fixtures actually interfered with production.

All of these factors had to be given consideration in the contemplation of any proposed lighting system.

In attempting to solve the lighting problem presented by the requirements of Budd Field, the first subject reviewed was that of a suitable light source. Of those commercially available, the three which were given consideration were: (1) incandescent, (2) mercury, (3) fluorescent.

An analysis was made of the pertinent data relating to each of the sources considered. It was logical that the high efficiencies of fluorescent and mercury vapor lamps should gain favorable attention. The longer life of these two types of sources held real significance from a maintenance angle.

The high efficiency of mercury vapor lamps merited particular attention. The then recently developed 3000 watt mercury lamp producing 120,000 lumens came in for much careful study. The high lumen output from a single linear light source was noteworthy from the standpoint of design because of the possibility of reducing the number of fixtures required to provide the level of illumination desired. This naturally meant fewer light sources to be maintained.

The apparent potentialities of the three k.w. mercury lamp were not all favorable. The intrinsic brightness of a source of such lumen output meant that a very serious glare problem might be presented. There was also the possibility of very uneven distribution and sharp shadows if a direct lighting system using this lamp were to be installed. Lamp failures with a direct lighting system might cause very low illumination levels in those areas where the outage of a three k.w. lamp occurred.

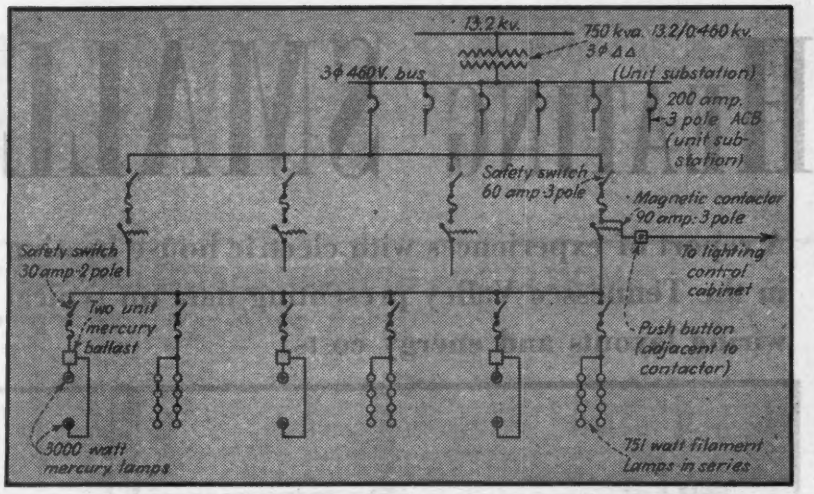
Actually, many layouts were made using the three types of lamps under consideration in almost every conceivable manner in which they could be applied. From these many engineering studies, five lighting systems were finally selected for further analysis. These five systems were (a) direct lighting using 1500 watt incandescent lamps in porcelain enameled steel high bay reflectors on approxi-

***UNITS CAN BE TIPPED** toward catwalk for servicing. Lock-stop arrangement assures return to proper angle. Three kw. mercury tube is being replaced. Unit beyond carries four 751 watt incandescent lamps.*

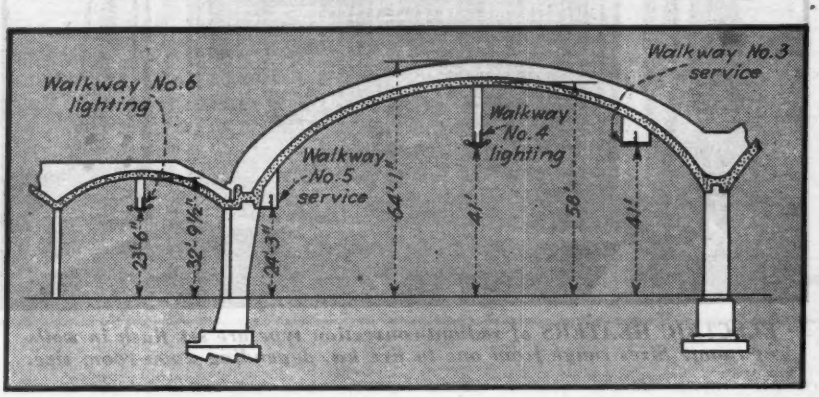
mately 18 ft. by 20 ft. centers, (b) direct lighting using 400 watt mercury vapor lamps in porcelain enameled steel high bay reflectors on approximately 13 ft. by 13 ft. centers, (c) direct lighting using a combination of 1500 watt incandescent and 400 watt mercury vapor lamps in twin porcelain enameled steel high bay reflectors on approximately 24 ft. by 22 ft. centers, (d) direct lighting using 100 watt daylight fluorescent lamps in two-lamp porcelain enameled reflectors mounted in continuous strips on approximately 15 ft. spacings, (e) an indirect lighting system using 3000 watt mercury vapor lamps.

These analyses included the initial investment for luminaires and lamps; the cost of auxiliaries where required; the cost of installation; the cost of walk-ways where recommended; the cost of service trucks where suggested; the cost of painting where essential to the lighting system. Then, this initial investment for each system was amortized on a basis of eight years, five years and three years. Additionally, the service costs were analyzed, establishing the kilowatts; the kilowatt-hours per year on 8000, 5000 and 3000 hours burning: the annual energy cost on the same basis; the number and cost of lamp renewals; the man hours for relamping and servicing of each unit; the actual maintenance cost of labor and, additionally, the cost of repainting the interior of the plant where recommended as a specific requirement for lighting purposes. Thus, for each system, there was an estimate of the annual servicing cost plus the annual capital charges. The result of these studies pointed to the probability that the totally indirect 3000 watt mercury system could be justified on an economic basis.

There were many circumstances in this particular project which gave rise to the hope that a satisfactory and acceptable solution could be obtained with an indirect lighting system. The curvature of the ceiling of the tunnel-like bays indicated the possibility of using these ceilings as a natural reflector. If a light source of sufficient candlepower could be suspended from the zenith of the arch to approximately the mounting height already established by the limitations of the Monorail system, the curvature of the ceiling would act as an integrator to produce almost even illumination throughout the working areas. From such a light center position, the maximum to minimum ratios in distribution of light flux to the floor level was computed to be 1.25 to 1.



***SCHEMATIC DIAGRAM** of lighting distribution. Lighting control cabinets are located on floor at building columns. Safety switches and mercury ballasts are mounted on catwalks.*



***SECTION** showing high-bay and low-bay dimensions. The two high-bays are 135 feet wide while the six low-bays each span 50 feet. All bays are 1800 feet long.*

The 3000 watt mercury vapor lamp gave promise of meeting these requirements. It was therefore conceived that a continuous cat-walk should be suspended from the center of the ceiling of each bay. In the large bays the cat-walk would be suspended 17 feet from the zenith of the arch, thus providing the 41 foot clearance above floor level which was required. In the small bays the cat-walks would be suspended at a maximum of 9½ feet from the zenith of the arch, providing the 23 ft. 6 in. clearance stipulated for this area. Thus, there was suspended from each arched ceiling a continuous cat-walk 1800 feet long or, in the total of 8 cat-walks, some 2.7 miles of lighting system. On either side of these cat-walks were to be mounted specially designed reflectors spaced at regular intervals.

Each reflector was to house a 3000 watt mercury vapor lamp. The concrete ceiling was to be painted a matte white of not less than 80 per cent reflectivity.

Actually, however, in view of the fact that considerable female help would be employed in this plant and realizing that objections might be raised based on a personal appearance of the employees under the blue-green predominance of a straight mercury vapor installation, it was decided that an incandescent component should be added.

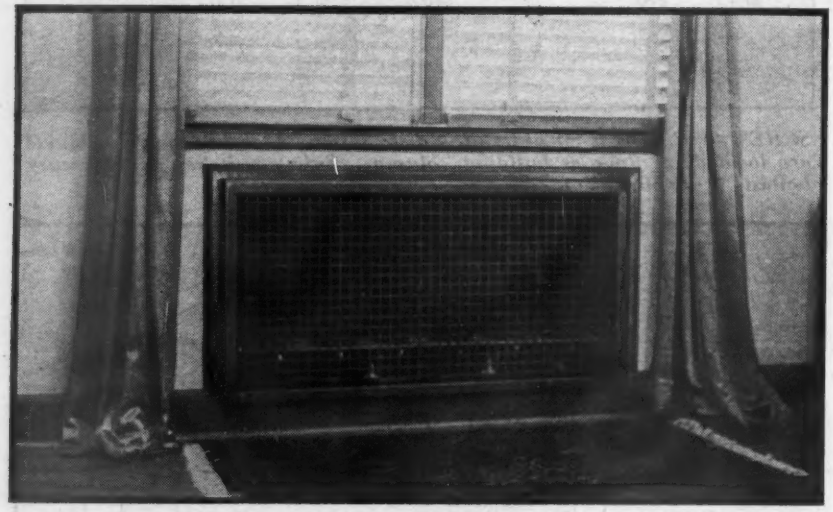
The installation itself has many unique features. Electric service for the entire plant is furnished at 66,000 volts and is stepped down at the main sub-station to 13,200 volts. Power is transmitted at this voltage through underground ducts to eight indoor sub-stations in the assembly building.

Located at each of the eight sub-stations is a 750 k.v.a. transformer for lighting service. Each transformer steps down the potential from 13.2 k.v. to 460 volts whence it is distributed by a three phase bus through 6–200 ampere, 3 pole air circuit breakers incorporated in a unit sub-station. From each air circuit breaker service is carried to a section of the cat-walk where it is split into several lighting circuits. Each lighting circuit is protected by a 60 ampere 3 pole safety switch and is remotely energized by a pilot circuit

[Continued on page 193]

HEATING SMALL HOMES

A report of experiences with electric house heating in the Tennessee Valley presenting data on typical wiring layouts and energy costs.



***ELECTRIC HEATERS** of radiant-convection type are set flush in walls of room. Sizes range from one to five kw. depending upon room size.*

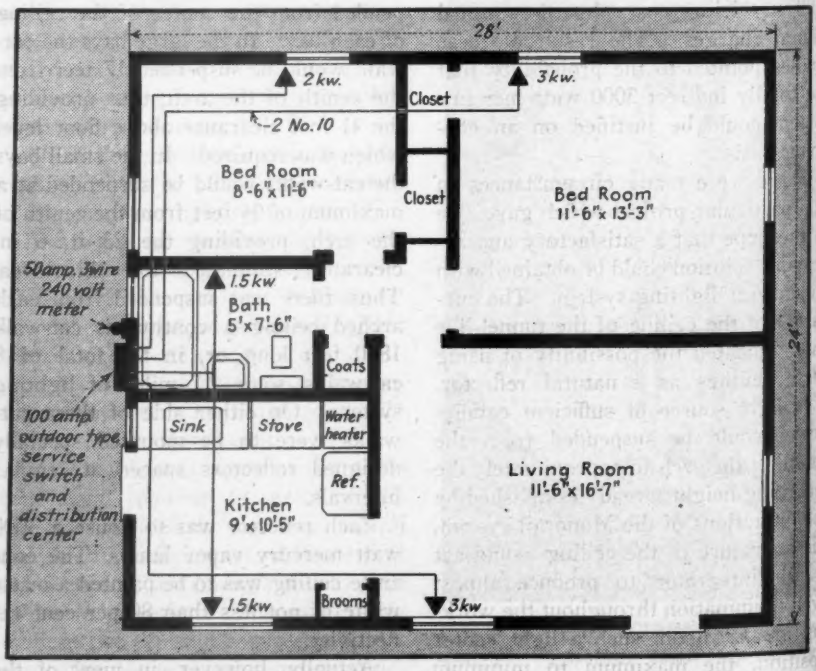
ELECTRICITY for house heating is not a new subject. As early as 1914, homes in the Northwest were being heated electrically. By 1920 there were over 2000 homes in Tacoma, Washington so heated. Prior to the war electric house heating spread rather rapidly on the west coast, particularly in central California. However, electric rates and the seasonal nature of the load were retarding factors.

The use of electricity for house heating in the Tennessee Valley began about 1935 when the introduction of low-rate energy made it economically feasible. Today there are about 1000 electrically heated homes scattered throughout Tennessee and the northern parts of Alabama and Mississippi. Public acceptance is quite well established in this area and customers have found that electric heating numbers among its advantages—cleanliness, elimination of fuel storage and waste removal, quick availability of heat when required. Recent inquiries indicate the existence of a keen interest in this development and at least four investment builders have expressed intentions of building several new "all-electric" homes, including electric heating, as soon as materials are available.

This interest has stimulated much discussion and raised a number of pertinent questions regarding the amount of energy required and the cost of heating homes of different size and types of construction, the load demands of a heating installation and when they occur. To answer some of these questions, TVA, through the extensive cooperation of various power distributors, has collected data on a number of typical electrically heated homes, including size of house, volume of space, heating installation, kwh. used, load demand records and the annual energy cost. The data is presented in accompanying table.

Factors Affecting Heat Requirements

Regardless of the method used to heat a house, certain basic principles concerning the heat requirements and heat losses of the structure itself must be observed. Various combinations of materials are employed in house construction. The rate of heat transfer through walls, ceilings, and floors has been the subject of intensive laboratory study and data are available for computing the theoretical heat losses from any building. Due to conditions of occupancy, however, the actual amount of heat used in a given home may vary quite widely from such theoretical values. Irregular living habits, the



***TYPICAL WIRING LAYOUT** for electric heating installations in small homes. Heaters in each room (radiant-convection type) are controlled by individual thermostats.*

From a paper presented at the A.I.E.E. summer technical session at St. Louis.

ELECTRICALLY

By Buford H. Martin
Electrical Engineer
Division of Electrical Development
Tennessee Valley Authority
Chattanooga, Tennessee

TABLE I . . . ANALYSIS OF ELECTRIC HEATING FOR 30 HOMES
(Averges per house in size groups)

No. Rooms	Volume Cu. Ft.	Connected Load-Kw.		Annual KWH.		Annual Energy Cost	
		Total	Heating	Total	Heating	Total	Heating
4	6,240	28.79	13.98	14,848	9,314	$126.80	$48.50
5	7,500	31.00	16.50	16,910	10,186	134.84	52.14
6	11,780	37.60	23.00	22,399	15,551	174.78	89.58
9	11,922	50.50	32.90	23,751	17,763	184.39	105.07
Average per house	8,930	34.28	19.48	18,278	12,052	147.07	65.98
Average per room	1,685		3.67		2,274		12.40
Average per cubic foot			2.18 watts		1.35		.0074

Note: The group of 30 residences from which the above averages were derived consisted of 10 each of the four- and five-room houses and five each of the six- and nine-room houses.

number of rooms constantly heated, absence from home, the presence of children or elderly people in the home, differences in retiring time and many other factors affect the heat requirements of the home. In fact, these frequently have more effect on the amount of current used than the difference in degree-days.

For the purpose of clarification—a degree day is a unit based upon the temperature difference, in Fahrenheit degrees, between the mean temperature of the outside air over a 24-hour period and 65 degrees F. The mean temperature is the average of the maximum and minimum temperatures of the period. The Tennessee Valley lies within a region of moderate climate, with normal winters averaging about 3,200 degree-days (southern portion, 2,500; northern boundary, 4,000).

Majority of Houses Small

Electric heating in this area has been confined almost wholly to what might be termed small homes—having a volume of heated space ranging from 6,000 to 9,000 cubic feet. A few are as large as 12,000 cubic feet.

A small four-room (6,240 cu. ft. volume) well-insulated house (see typical layout) will have a heat loss of about 35,000 B.t.u. per hour based on a temperature difference of 70 degrees between the outside air and room temperature. This is 500 B.t.u. per hour for each degree difference. The theoretical load for a 30-degree day would, therefore, be 15,000 B.t.u. per hour—or 106 kwh. for a 24-hour day. With a 3,500 degree-day heating season, such a house would require 12,600 kwh.—based on the assumption that all parts of the house would be heated to the same temperature all the time. In actual practice this is never true since much of the time there is little or no heat used in the bedrooms—resulting in the actual heat used being less than the computed values.

Energy Used for Heating

The estimated average amount of current used for heating is indicated in Table 1. These values were determined from records of amounts of current actually used, with the kwh. used during the summer months as a base from which was calculated the amount of current used for non-heating purposes. The average amount of current to heat a four-room house was 9,300 kwh. per heating season; for a five-room house, 10,200 kwh.; for a six-room house, 15,500 kwh.; for a nine-room house, 17,760 kwh. Records were kept on a group of 10 four-room, 10 five-room, 5 six-room and 5 nine-room houses. The average for the 30 houses was 1.35 kwh. per cubic foot per season at a cost of 7.4 mills per cubic foot based on the standard TVA residential rate.

Further analysis of data revealed that it required from 20 to 35 percent *less* current to heat well-insulated houses than those homes with poor or no insulation.

When evaluating the "cost" of electric heating as against other means, comparison should not be made on a "cost of fuel" basis alone. Other savings must be taken into consideration such as economies in cleaning and redecorating which users of electric heating are quick to point out. Also the total construction cost of the house can be reduced through the elimination or better use of space required for the conventional heating plant, elimination of chimney, etc. Cost studies must be made on an over-all basis.

The installation cost of electric heating systems in these homes, including necessary wiring, heaters, and prorated additions to the service and meter equipment averages about $25.00 per kilowatt.

[Continued on page 192]

CLAMP DETAIL **of pole-end used for starter replacement. Note moving and stationary clamp jaws with handle release.**

POLE FOR Relamping Fluorescents

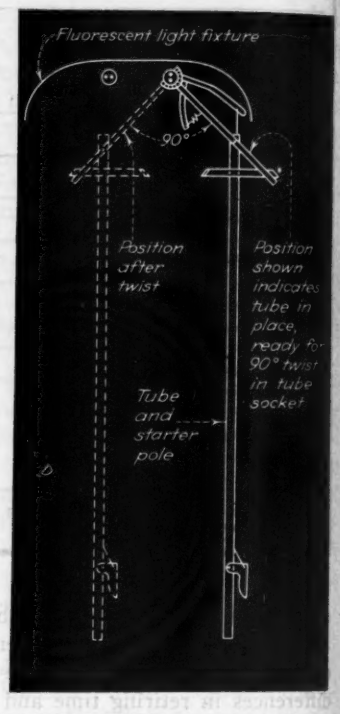
Unique design of pole-mounted clamp for replacing starters and tubes from the floor.

By Alex Precoda

Saginaw Steering Gear Division
General Motors Corporation
Saginaw, Michigan

THE old method formerly used to replace fluorescent lamps and starters in open faced two-tube 100 watt industrial fixtures required the use of a twelve foot platform type of step ladder. (An extension ladder in our high ceiling building was out of question.) Because of the ladder's size and weight the maintenance man was constantly maneuvering his ladder around the congested plant in order to work on the lights. In many cases, the machinery below the lighting fixture was in such location and of such nature that it required the straddling of the machine by the ladder, which required additional help in placing the ladder. The vast majority of the man's time was spent, not in lamp maintenance, but in positioning his ladder.

To eliminate this cumbersome procedure, a device known to us as a "tube and starter pole" was designed and made of materials on hand. It has been in use now for some time and is obviously the solution to our problem and can be converted, in most cases, very easily to the particular make of open faced fixture any plant might have installed. The entire operation now of replacing the 100 watt fluorescent tubes and starters is easily done by one man who does all his work from the floor level. This also increases his ability to do the same amount of replacement in at least half the time with resultant savings. The new method, in addition, eliminates all ladder hazards of the old method.



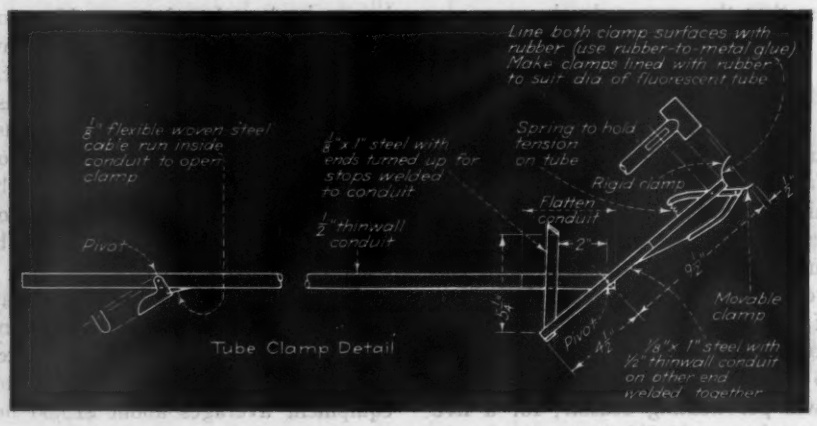
MOVING POLE **from one side to the other automatically moves the pivoted arm through 90 degrees turning the tube through the same arc and locking it into position.**

The "tube and starter pole" is a combination device. One end is used to handle the starter replacement while, by simply turning the pole end for end, the workman can use the same pole for tube replacement.

The accompanying diagram explains in detail the mechanism of the "tube and starter pole." The important detail and dimensions are given and enough explanation shown on the sketches to permit construction of a similar pole to meet the requirements of the particular plant installation. Each working mechanism is shown alone to clarify detail, and can be combined by placing them on opposite ends of the same pole. The pole is of ½ inch thinwall conduit for rigidity and light weight. The entire weight of the complete unit is five pounds.

To use the pole, it is seen that the

[Continued on page 196]



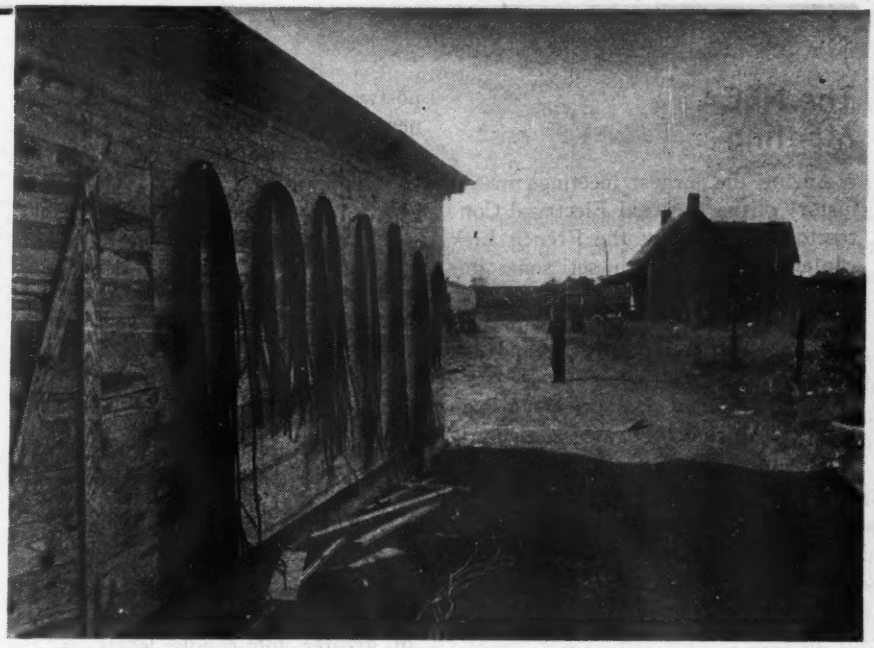
DETAIL **of tube end of pole showing clamp mechanism mounted at end of pivoting arm.**

Cable Loops SPEED WIRING

Cut to size, stripped and ready to install, prepared cable loops speed war housing construction jobs.

MORE than 50 factories are turning out prefabricated homes for the Federal Public Housing Authority and hundreds of contractors are employing some form of on-the-site fabrication or assembly. Standard sizes and dimensions have resulted in time saving wiring techniques on cable work in on-the-site construction and factory prefabrication includes facilities for connections as walls and roofs are assembled.

During the manufacture of the various sections, the cable runs and junction boxes are attached to the supporting studs. Then as the various "wired" studs are nailed into place in the wall or ceiling section, cable-ends are brought out through the plate. This enables the wireman at the job site to pull out all slack for run to ceiling, or base outlet, or junction point as the case may be.



***CABLE CUT** to seven standard lengths fit all runs. Electricians select exact number needed for one house. Cable ends are already stripped and cleaned.*

Various systems are used for connections during assembly of wall sections. Sometimes cables are attached to connector points which connect automatically when the panels are bolted together during erection. Often the cables are picked up over the ceiling or under the floor and connected through conventional junction boxes.

In some types of prefabricated homes chases for wiring are provided by rabbetting exterior stud members of exterior or interior wall panels at the base. Wiring is installed conventionally after erection and the base applied by carpenters when they trim.

***FACTORY FABRICATION** process shows how main entrance cable and box are attached to a supporting stud.*

***WALL PANELS** are wired during manufacture. Boxes and cable are installed before panels are closed.*

EDITORIALS

W. T. Stuart, *Editor*

The NECA Meeting

Among the largest meetings in the history of the National Electrical Contractors Association, the French Lick conference last month set some important industry policies and objectives. It remains for the headquarters staff, the active committees and the members to carry them out.

Reactivation of committee work on technical projects was particularly heartening. The Codes and Standards Committee, facing the 1945 Code revision and the standardization problems which postwar freedom from emergency regulations will bring, devoted hours of conferences to such questions as No. 12 wire minimum and safety switch ratings. A large panel of estimators worked with George Patterson on revising and bringing up to date valuable cost and labor data. Wartime methods and advanced tooling have contributed much to this highly technical field and the experience should be made a part of industry data as promptly as possible.

In policy, NECA grows stronger and more confident against a background of wartime performance. The field service under Paul Geary has eliminated the sense of remoteness from headquarters which too frequently weakens organizations which must operate on a national scale. The increased emphasis on chapter activities and responsibilities is also contributing to stronger local action. The predominance of labor relations as a major function of the organization is still evident. Equal energy and vigorous action in market development would create a better balance. The proposed advertising campaign is a step in that direction and deserves enthusiastic support. There is also a real need for industry research, along the lines developed by Walter Collins in Chicago. Factual data supported by continued research is vitally important to a sound market development program.

The 1944 meeting disclosed further growth in membership and a sound fiscal policy. NECA has built well and can look forward confidently to the postwar era, which will bring many new responsibilities and challenges to new achievement.

Indirect Industrial Lighting

In the preceding pages of this issue is the report of a lighting installation involving inverted units with the useful light reflected from the ceiling. In our opinion, this job marks a new milestone in the progress of applied lighting.

Totally indirect lighting is hardly new, but since the advent of the fluorescent lamp, with its low brightness level, there has been so much interest in greater foot-candle levels on the working plane that many useful and proven methods of light control have been ignored in an effort to push the lightmeter up another point.

The 3000 watt lamp, providing a high concentration of light, provides a lighting tool, however, that lends itself to indirect lighting methods. Practically perfect diffusion and quality was the result at Budd Field.

The combination of high foot-candle levels with high quality and complete elimination of glare in production lighting is an important step ahead.

Veteran Apprenticeship

To accompany reconversion after the defeat of Germany, the War Manpower Commission is planning to provide many veterans with an opportunity to learn trades through formal apprenticeship, chiefly in the metal working and construction trades.

It is intended that apprenticeship selection methods that have proved successful for non-veterans should apply to returning veterans, except for age and, in certain instances, physical requirements. At a recent meeting of apprentice training directors, it was the opinion of those attending that (1) The veteran's age should be considered the same as when he entered the armed forces. (2) Consideration should be given to physically disabled veterans to the extent that they are able to do the work required. (3) Credit should be given for previous training or experience and consideration should be given to the veteran's maturity.

This plan comes at a time when electrical contractors and unions are giving much thought to apprentice training. It is one which can be carried into existing apprentice training programs very effectively. Edward Brown of IBEW and Robert McChesney of NECA participated in the conference out of which the plan was developed. It should have full support.

With electrical work growing in complexity and demanding new skills and training, it is essential that we develop a sound program of apprenticeship that will attract good men and give them a thorough groundwork. The men who will provide the technical skills and workmanship for postwar are in the services today. They should be given every opportunity.

Night Baseball On New Guinea

Play under lights in the New Guinea area is baseball news but play under indirect light—that's electrical news. Billy Sanders described the job in a letter home. Lou O'Neill sportswriter for the Long Island Daily Star tells the story.

The jungle league field needed light for night play. To get the proper lighting effect required poles 50 feet high. The boys cut down 12 coconut trees and placed them around the field. Then they built reflectors of boards at the top of the poles and painted them white, they measured 20 by 20 feet. About 12 feet from the bottom of each pole they placed a searchlight of 800,000,000 candlepower with the beam focused on the reflectors at the top of the pole. Four 750-watt floodlights were placed around home plate to eliminate possible shadows.

So there you are, night baseball under indirect lighting from anti-aircraft searchlights. The industry can use plenty of this kind of ingenuity in the postwar days ahead.

Appraisers Should Learn Wiring Values

Appraisal chart, giving the loan value of electric wiring in residences has been worked out by the Pacific Coast Electrical Association. Lending agencies are enabled to earmark the amount of the loan represented by wiring. Two of the largest chain banking interests in California have called meetings of their home loan department men and appraisers to study the chart and the relation of appraisal values to adequacy.

It will be a strong lift to adequate wiring if more lending agencies could be told the story. The value of adequate wiring to the user is plenty more than what it costs. Nevertheless, it would be helpful if features of electrical adequacy were promptly and accurately recognized by the appraiser.

Protection Against Anti-Trust Violation

Walter Walsh, attorney for the San Francisco Electrical Contractors Association, which recently successfully defeated an anti-trust indictment, proposes an amendment to the Sherman act that would protect business against unnecessary expense and would solve the trade association's problem.

The amendment, which he credits to B. A. Javits, is essentially that any group whose activities might run afoul of the anti-trust laws could file a petition in the U. S. District Court, serve a copy upon the anti-trust division, and publish a notice of hearing to determine the legality of the proposed contract or activity.

At the hearing the public would have a right to intervene, all those in the industry would have the right to be heard. The court would approve or disapprove the proposed contract. Activities under an approved contract could not then be assailed by the Federal government. If the government at a future time had an objection, they could then issue a cease and desist order which would permit the organization to liquidate or modify the practices and no criminal or civil action would lie against the members.

This is an eminently sensible plan. It should be considered carefully by the Congress and this or a similar amendment be drawn to protect business men in their trade association activities.

Bare Neutral

Before every Code revision, the question of bare neutral conductors is bound to come up. It is under discussion now by code committees. It is very unlikely that the much talked about system will be approved. The trend is, in fact, pretty much the other way.

The last serious contemplation of the practice of using uninsulated neutral conductors came with the early stages of material restrictions. Rubber was critically scarce. Emergency insulators were developed which could be used for the grounded neutral. And if more persuasive arguments for adopting bare neutral systems have since come forward we haven't heard them.

With the increased load and more complex systems in prospect after the war, there is more reason than ever to provide substantial insulation on all current carrying conductors. The distinction between grounded neutral conductors and grounding conductors becomes more important as currents increase.

If about half the energy that has gone into attempts to strip the insulation of neutral conductors could be devoted to improving grounding practice in the interest of rapidity, we should be far better off.

Conduit Controls Now Relaxed

Restrictions on the installation of conduit, tubing and other metallic raceways have been removed, by an amendment to limitation order L 225. While controls remain at the manufacturing level and through priority rating, the particularly difficult restrictions on use need no longer be considered in layout and installation.

This is a much needed amendment and evidence of the progress in WPB toward dropping restrictive orders at the earliest practical moment. Other rules affecting construction at the operating or installation level are also due for amendment soon.

Washington Notes

▶ Successful invasion of the Philippines is reviving predictions once voiced privately by Navy men that the Pacific theater operations may come to a conclusion very soon after the collapse of Germany. Program cutbacks scheduled for V-E Day are sufficiently moderate, however, to indicate that those responsible for materials are not so hopeful.

▶ WPB's spot authorization plan is moving ahead without much fanfare. Civilian goods production has been authorized in about 750 plants where the shift could be made without interfering with war work.

▶ Surplus property sales are increasing. Long lists of electrical materials are among the items now being offered. Many of the items, however, are specialties.

▶ Manpower controls are being tightened, particularly along the West Coast. Several programs are under schedule, practically all due to manpower problems. Heavy ammunition, heavy trucks and certain combat vessels are among the most critical programs.

▶ The N.H.A. predicts that 12,600,000 non-farm houses and apartment units will be required in the first postwar decade.

▶ Restrictions on installation of electrical conduit, metallic tubing and raceways have been removed from L 225, but the amount of metal which n.ay be used in manufacture is still limited on the basis of the amount used in 1941. The order also retains the provision that manufacturers and distributors may sell only to holders of AA 5 ratings or better.

▶ Also revoked is L 168 which controlled blackout and dimout lighting fixtures. Production and sale has practically ceased.

▶ Civilian goods from reconversion will be priced at 1942 levels according to OPA. No change in pricing policy is contemplated for civilian goods during the war.

▶ WPB is far ahead of other government agencies in preparation for V-E Day. Some 350 orders are ready to be dropped.

▶ Termination of war contracts promises to require a huge staff of trained men. Government people hope that industry will volunteer its best men to this all important job. Much of the job will be hard, thankless work but the national economy may depend on how well it is done.

BRIEF ARTICLES about practical methods of installation and maintaining electrical wiring and equipment and up-to-date estimating and office practices. Readers are invited to contribute items from their experience to this department. All articles used will be paid for.

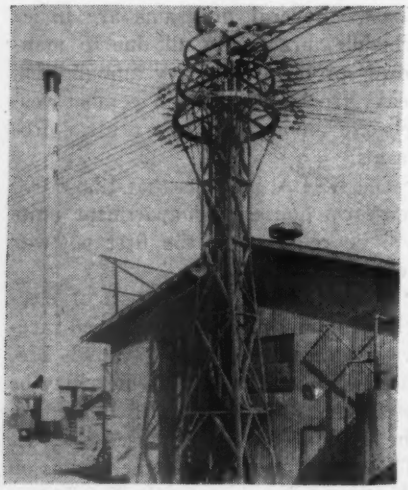
PRACTICAL METHODS

TOWER FOR OVERHEAD DISTRIBUTION

INDUSTRIAL

L. J. Meller, of the Meller Electric Co., Huntington Park, Calif., originated and built this distribution tower in an unusual industrial application.

Nine hundred horsepower was to be distributed, three phase, 220 volts to 15 buildings of the Morris P. Kirk &



***DISTRIBUTION** circuits radiate to fifteen buildings from this central tower.*

Sons plant, Los Angeles. These buildings are scattered over a tract 300 feet in radius, the whole site being constructed on ground consisting of furnace slag, almost impossible to excavate without blasting.

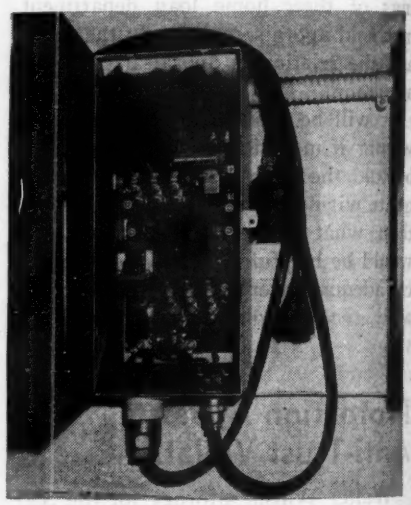
So it was decided to go through the air and this 33-ft. tower was built to carry the spans. Legs and braces of the tower are of angle iron and in the beginning three rings were mounted on the top as shown by the photograph, to give attachment for the strain insulators. A fourth ring has been added recently for further circuits. Reading from the bottom, the rings are 8 ft., 6 ft. 7 ins. and 4 ft. in diameter. Conduit runs for the 15 circuits are brought out from the adjoining building where the panel board is located and run up through the center of the tower. The panel board is equipped with a 2400-amp. main switch. On one circuit the weight of copper is 1340 lbs., on a span of 180 ft.

"For expansion purposes during the war, this has been a life saver," said Mr. Meller. We could go any place with the system on short notice and without interrupting activities anywhere on the site as would be the case in making excavations.

MOTOR TEST EQUIPMENT

INDUSTRIAL

Running-tests on motors that have been removed for maintenance are made in the plant electric shop of the Harrisburg Steel Corporation. One wall of the shop is devoted to starting equipment for every type of motor used in the plant. The large starter on the right in the accompanying illustration is used to test all the d-c crane motors and will handle up to 35 horsepower at 250 volts d-c. The three starters in the center are equipped to handle maximum ratings of 10 hp., 30 hp. and 60 hp. respectively at 440 volts three phase. The starter on the



***CLOSE-UP** of large 440 volt test starter showing portable cables to motor leads and pushbutton circuit. Extension of pushbutton circuit permits operator to be at motor side while starting and stopping to observe action.*

***STARTERS FOR RUNNING-TESTS** on motors in the electric shop. L. to R. —the starters will handle 25 hp., 3 phase, 220 v.; 10 hp., 30 hp. and 60 hp. at 440 v., 3 phase; and (on extreme right) up to a max. of 35 hp. 250 v. d.c.*

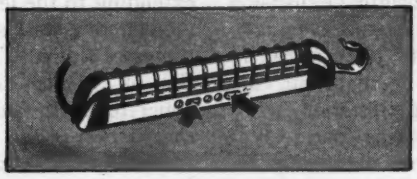
Fluorescent operating hints

No. 6 of a series by SYLVANIA for all users of fluorescent lighting

WHICH STARTER TO USE

To light a fluorescent lamp, the two cathodes should be preheated for a short interval. The circuit must then be broken to establish the lighting arc. The fluorescent starter performs this function, acting as a time-delay switch. One starter is required for each lamp in a fixture. (Research has eliminated the starter from the fluorescent circuit in the laboratory, but starterless fluorescent equipment is not yet commercially available in quantities.) Following are the types of starters in most common use today:

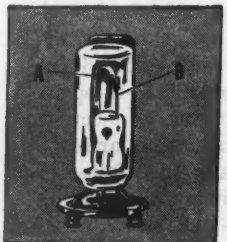
MANUAL STARTER



Manual starters are the simplest type and are used principally on desk lamps or other portable fixtures. For example, in the Sylvania P-7 Fluorescent Extension Cord Lamp shown above, one switch turns on the current, and a second is pressed until the ends of the lamp glow to indicate adequate preheating. Then, the second switch is opened so that the lamp can strike its lighting arc. Manual starting is impractical for large installations or inaccessible fixtures, for which the following types of automatic starters have been developed.

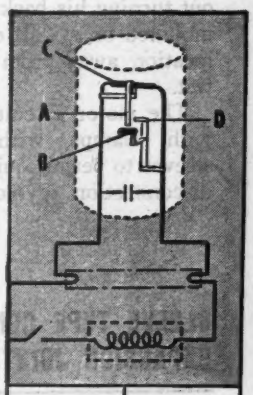
GLOW TYPE

Glass bulb of starter is filled with low-pressure Argon gas. Current makes gas glow, and the resultant heat causes bimetal strip *A* to move over to make contact with *B*, thus preheating the lamp cathodes. This extinguishes the glow in the starter, thus cooling *A* and causing contacts to open. Current then establishes the lighting arc through the fluorescent lamp. Sylvania glow-type starters are manufactured under the name of Glostat, a quick-acting, rugged starter recommended for small and medium-sized fluorescent installations.



With Lamps of this Wattage	Use Sylvania Glostat Model
30-40	FS-4
15-20	FS-2
4-6-8	FS-5

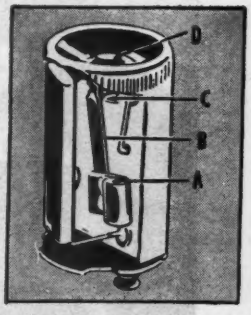
THERMAL TYPE



In a thermal or resistance-heat-operated starter, when the line switch is closed, the bimetal operating strip *A* is touching carbon contact *B*, thus allowing the current to preheat the lamp cathodes. However, the heat generated by the current at this point of contact causes the bimetal *A* to move away from *B*, thus causing the current to strike the lighting arc. *A* is kept away from *B* by heat generated in resistor *C*, which is subjected to the same voltage as the lamp. In restarting, after a momentary interruption of current, *C* is subjected to full-line voltage, and the additional heat causes *A* to bend until it touches restart contact *D*. This allows current to preheat the cathodes again; but, at the same time, it short-circuits *C*, so that *A* moves away from *D*, causing the current to strike a lighting arc again. The Sylvania thermal-type starter is the Mirastat.

With Lamps of this Wattage	Use Sylvania Mirastat Model
15-20	M2
30-40	M4
65	M7
100	M6

CUT-OUT (PUSHBUTTON) TYPE



When a lamp fails, automatic starters continue to make an effort to light the lamp. This causes blinking, wastes current, and injures the starter and ballast. Where immediate lamp replacement is impractical, use a starter with a mechanism that cuts the failed lamp out of circuit automatically. Cut-out starters are the thermal type with circuit breaker consisting of a small resistor *A*, a bimetal latch *B* as one contact, and a phosphor bronze spring *C* as the other contact. The current passes through these elements, which are held in contact position by the latch. When a lamp fails, heat is generated in *A*, which releases *C* and cuts the lamp out of the circuit. With a new lamp in place, the circuit breaker can be reset by pushing button *D*. Pushbutton starters last five to ten times longer than automatic starters, and they eliminate blinking. They are recommended particularly for large installations where the investment in fixtures and lamps is considerable. The Sylvania pushbutton starter is the COP (Cut-Out-Premium), available in model COP-4 for 40-watt lamps.

For additional maintenance information,
SEND FOR THIS FREE BOOKLET ➡

One Standard — The Highest Anywhere Known

SYLVANIA ELECTRIC PRODUCTS INC.

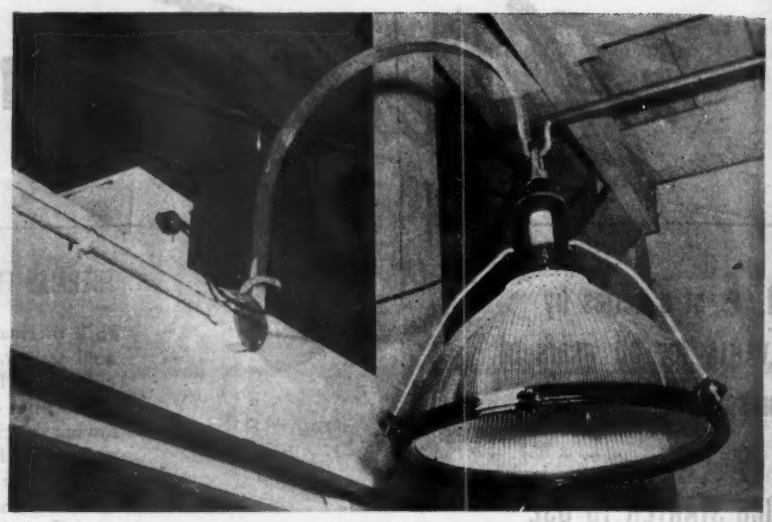
SALEM, MASSACHUSETTS

FLUORESCENT LAMPS, FIXTURES AND ACCESSORIES, INCANDESCENT LAMPS, RADIO TUBES, CATHODE RAY TUBES, ELECTRONIC DEVICES

extreme left (with cover removed) tests 220 volt three phase motors up to 25 horsepower.

Each starter is magnetic type and is equipped with two portable cords; one for the motor circuit, and the other for the pushbutton circuit. This permits the operator to safely observe starting and stopping the motor without turning his back to throw a switch mounted on a wall or at some remote location away from the motor under test.

The motor circuit cord is equipped with clamps with rubber-jacketed sleeves to permit quick connection and disconnection to motor leads.

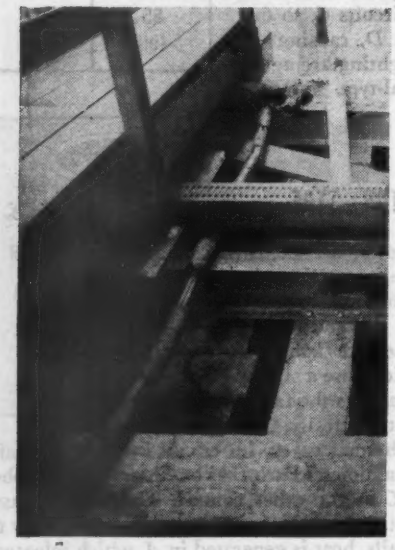


HIGH-BAY MERCURY UNITS have been hung with an eye to easy maintenance in the fabricating shops of the Bethlehem-Hingham shipyard in Boston. Fixtures hang from hooks on the end of long goosenecks bolted to the wooden building chords. Plugs permit the units to be removed and lowered for easier, quicker cleaning to maintain high lighting levels.

SLEEVE TYPE CONDUIT EXPANSION JOINT

WIRING

When the Chicago Park District tore up a section of sidewalk on the elevated portion of Michigan Avenue to replace an expansion joint, the fibre conduit containing the boulevard lighting cables embedded in the walk were shattered as was the original expansion joint on the conduit system. New conduit expansion joints had to be installed at this point to maintain continuity of the lighting circuits.

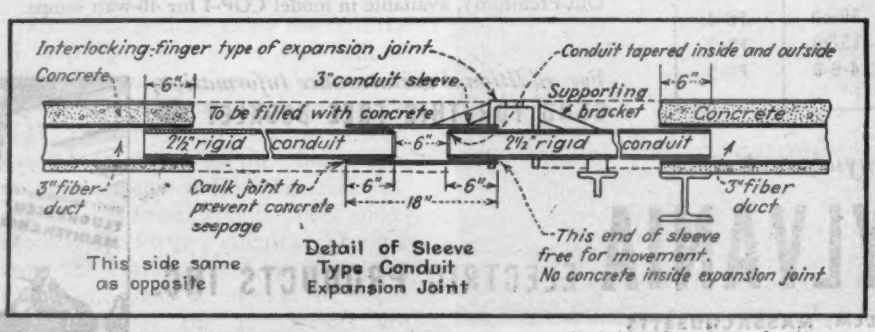


BOULEVARD LIGHTING is maintained by these existing cables, protected by shattered sections of fibre duct, while new interlocking-finger type of sidewalk expansion joint is being installed. Note how cables must duck under the expansion joint.

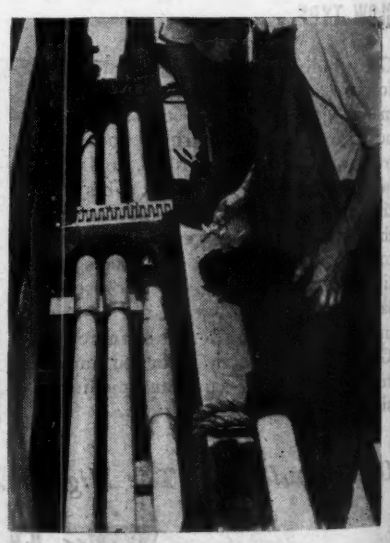
The new interlocking-finger type steel expansion joint extending the width of the 30-ft. sidewalk was at right angles to and in the same plane as the lighting conduits embedded in the walk. To permit passage of the conduit extensions, the sides of the expansion joint were cut so the extensions could maintain the same spacing and elevation as the ducts in the sidewalk.

Two sections of 2½-inch rigid steel conduit, each extending a minimum of six inches inside the 3-inch fibre ducts in the sidewalk, bridged the 12-ft. opening in the walk. Instead of meeting at the center, an expansion area of 6-inch length is maintained between these two steel conduits. Covering this open space is an 18-inch sleeve of 3-inch heavy steel conduit with a 6-inch overlap on each of the 2½-inch conduit extensions (see sketch).

Only one inch of this telescopic sleeve extends inside the interlocking-finger expansion joint—the rest of it extending to the left to be embedded in the concrete walk supported by the stationary column. The right-hand section of 2½-inch conduit, embedded in concrete up to the expansion joint in the portion of the walk supported by a "free" column, slides in and out of the 3-inch sleeve as the sidewalk and elevated roadbed expands and contracts. To permit free movement within the sleeve expansion joint and to prevent damage to the lead covered cables in the ducts, both the inner and outer edges of the 2½-inch rigid steel conduit extensions are filed down to a smooth taper.



DETAIL SKETCH of expansion sleeve joints installed by Chicago Park District to maintain continuity of street lighting ducts at an expansion-joint section of an elevated highway.



EXPANSION SLEEVES are installed on rigid conduit extensions of sidewalk ducts. Sleeve on third conduit is pushed back to show the expansion tolerance between conduits. Note position of conduit sleeve with respect to sidewalk expansion joint.

"Follow the leader" is no kid's game

The way Toledo plays it!

● Zooming to the target... the squadron leader sets a gruelling pace for others to follow.

Industry, too, has its pace-setters—and in Pipe Tools for nearly half a century that leader has been TOLEDO!

It's been tough to be a leader... every leader knows that.

It means constant hard experimental work and research.

It means continual vigilance in every phase of our manufacturing...

And it means a fair sales policy—fair to the user—fair to the distributor.

But we like our role...for we know, that which deserves to lead leads.

And so you can expect the new things that really count to come from Toledo... *first!*

The Toledo Pipe Threading Machine Company, Toledo, Ohio. New York Office, No. 2 Rector St.

TOLEDO

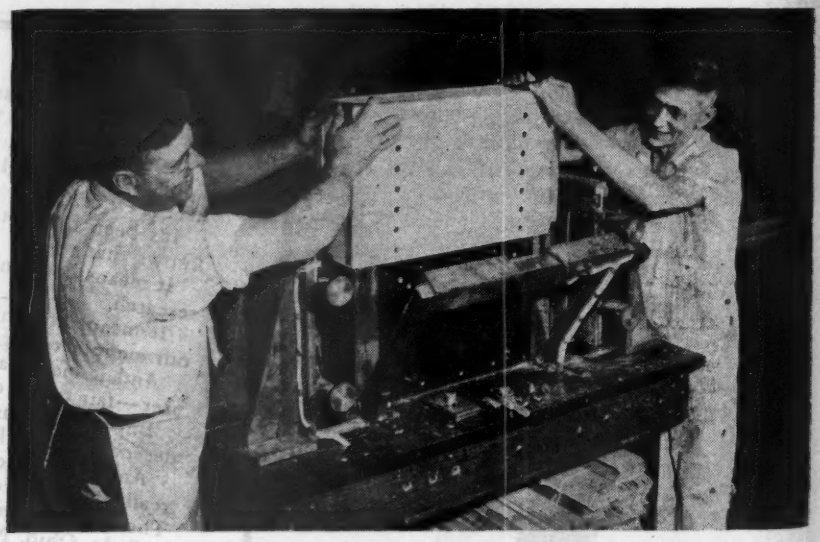
PRECISION PIPE TOOLS

Toledo SIMPACT—self-contained, adjustable threader for 1" to 2" pipe. Sizes changed instantly with one set high speed steel dies. Accurate, dependable.

Where the 2½-inch conduits enter the embedded fibre conduits and at the "stationary" joint of the 3-inch expansion sleeve, the joints are caulked and wrapped with ordinary friction tape. A coat of waterproofing varnish over the tape insures against any conduit seepage into the expansion joint or sidewalk ducts when the concrete is poured.

The sidewalk expansion joint was approximately half way between two hand-holes in the sidewalk, 115 feet apart. It was a simple matter to pull back the cables from one hand-hole to the other and snake them through again when the duct continuity was completed. The edges of the conduit extensions and the inside of the expansion sleeve were liberally coated with a lubricating grease to ease the pull on the re-installed cables. In all, four expansion joints of the sleeve type were installed to accommodate the four ducts in the sidewalk.

TOPS AND BOTTOMS of plywood ammunition boxes are first cured in a device resembling a sandwich grill.



THE ENTIRE BOX is then placed in the second curing unit in which sides are attached to tops and bottoms.

TOASTERS FOR CURING GLUE

INDUSTRIAL

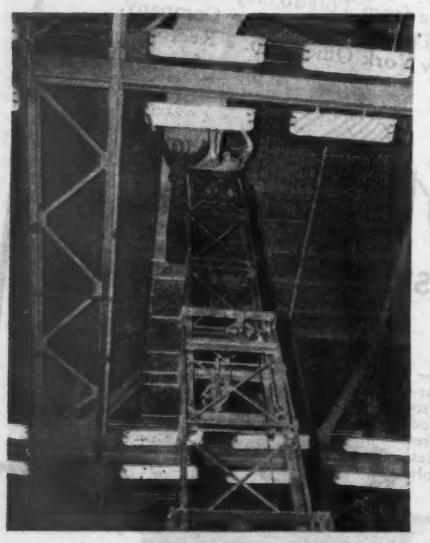
By using a "sandwich toaster" for direct application of heat, the new glue-curing device used by the Glenn L. Martin Company now cures PBM ammunition boxes in 15 minutes instead of three hours as by the previous method.

The old method took two men with three jigs to make ten boxes in 24 hours. Boxes were assembled on the jigs and baked in a curing oven for from two to four hours. The high cost of making extra jigs, tooling time involved, lack of extra personnel and valuable space in the curing oven prevented the wood shop from making more than a few boxes at a time.

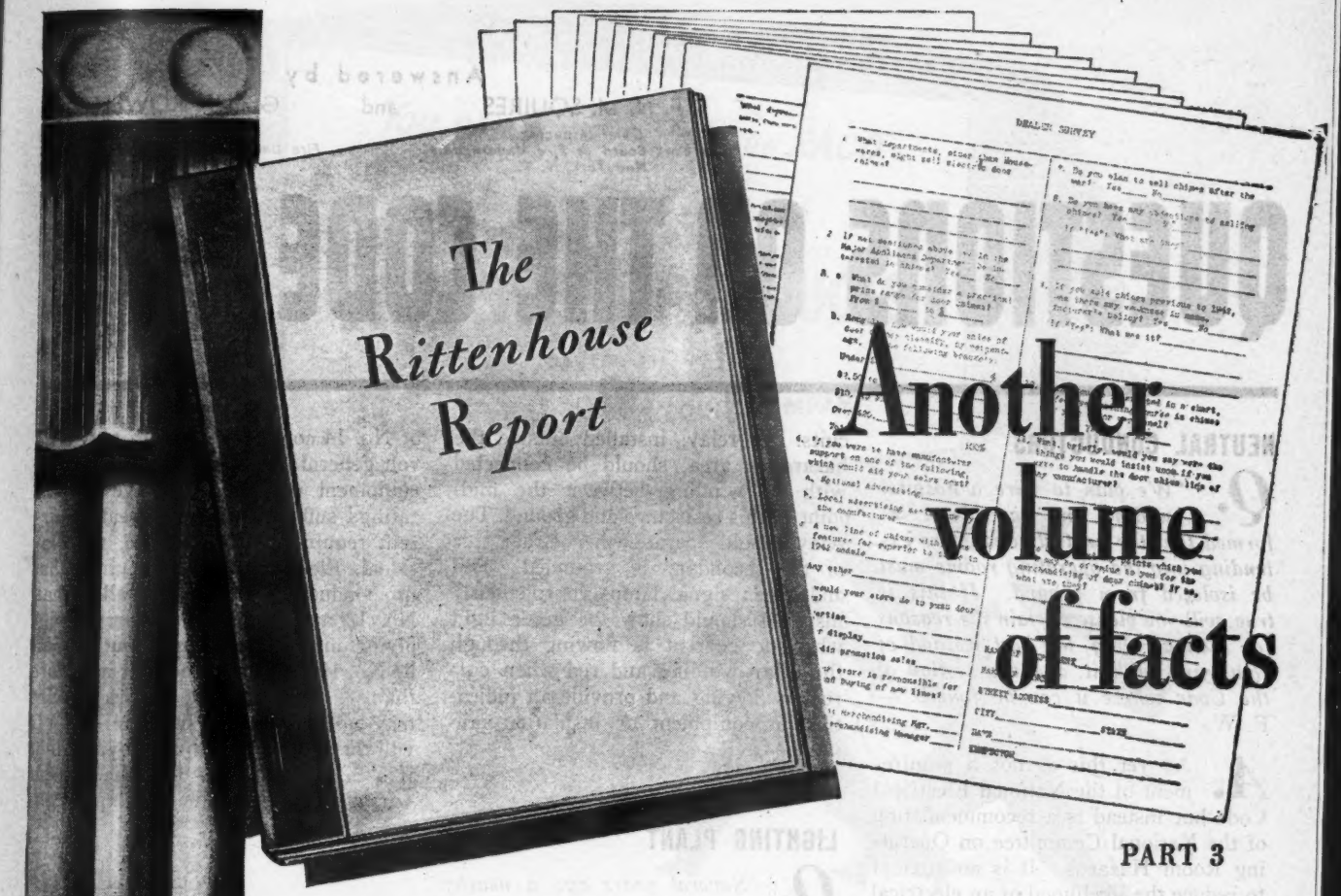
The new device is made up of two jigs. On one is assembled the tops and bottoms of the ammunition boxes. The bottom is then placed on the second jig where the four sides of the box have been assembled and angles glued to corners; the device is closed, clamps placed in position, and pressure screws turned forcing parts of the assembly to be pressed solidly to the heat box. This assembly is then cured for 15 minutes, and the operation is completed.

P. J. Kraus, foreman of the wood shop, conceived the original idea, and W. H. Bankard of the electrical department developed the two devices. A 220 volt electric air strip heater is completely enclosed in refractory material, encased in a steel sheath and covered with masonite to provide 120 degree heat without scorching the wood. Heat is thermostatically controlled so that low temperature is maintained throughout the curing process. This method of heating is less expensive than the use of high frequency.

The process is applicable to the assembly and fabrication of devices made of wood, plywood, masonite, etc., wherein the attachment of one part to another is performed with resinous synthetic glues which must be cured by the application of heat in the process of manufacture.



***TELESCOPING PLATFORM** raises maintenance electricians Howard Hart and Andon Turk high among the girders to replace RF fluorescent lamps at Consolidated Vultee's Fort Worth controlled conditions aircraft plant*



PART 3

High spots from the Dealer survey

Here follows a random selection of facts from the Rittenhouse Survey (Part 3). As they build up, a new picture of the future of the electric door chime business takes shape. Under aggressive Rittenhouse leadership, it is going to be an exciting and a most profitable part of your postwar selling program.

How closely does your thinking mesh with the following *facts* culled from nation-wide retail opinion?

EXCERPT 1—What percentage of leading retail outlets in the electrical appliance field expects to sell chimes as soon as available? The response to this figuratively was a tremendous roar—98.6% said *yes.*

EXCERPT 2—What are the five outstanding points which show up as salient *musts* for promotion of chime sales, as designated by retailing opinion?

*Better tone—style—quality	42.3%
*More attractively designed display boards	22.3%
*Firm price policy	22.3%
*More and better advertising sales promotion	23.8%
*Ease of installation—mechanical improvement—simplified repair service	30.7%

**Rittenhouse will have all five.*

EXCERPT 3—Are retailers sufficiently interested to put definite action back of electric door chimes? The return on this is significant—47.8% will engage in special chimes promotions; 58% will provide for special floor displays.

EXCERPT 4—What percentage of those interviewed consider chimes of such importance to their sales program as to warrant special sales courses for floor personnel? The reply shows definitely that chimes loom large in postwar selling, for 81% answered with a vehement affirmative to this question.

Rittenhouse expresses its gratitude to the retailers of the nation who studied the problem and who gave of their time that the facts which comprise Part 3 of the Survey could be compiled. Shortly they will be collected in a concise digest, available to all interested.

Next comes Part 4—the introduction to a national consumer study of electric door chimes . . . a presentation of the distilled opinion of 77 million people, on this subject. Watch for it.

Rittenhouse

The A. E. Rittenhouse Company, Inc.
Honeoye Falls, New York

TOMORROW'S BETTER DOOR CHIMES

Answered by
F. N. M. SQUIRES and GLENN ROWELL
Chief Inspector
New York Board of Fire Underwriters
New York, N. Y.
Electrical Engineer
Fire Underwriters Inspection Bureau
Minneapolis, Minn.

QUESTIONS ON THE CODE

NEUTRAL CONDUCTORS

Q. *"We plan to wire a hospital building and have been informed that the neutral conductors extending into the operating rooms must be isolated from ground. If this is true, will you please explain the reasons for such a ruling, the best method of complying with it, and the section of the Code where it can be found?"*—F. W.

A. As yet this is not a requirement of the National Electrical Code but instead is a recommendation of the National Committee on Operating Room Hazards. It is an attempt to reduce the likelihood of an electrical arc or spark in a room in which explosive concentrations of anaesthetic gases are present. This recommendation is as follows:

In hazardous locations all electrical circuits should be fed by an insulating transformer which isolates them electrically from the main feeder and from other circuits in the building. This transformer should be of the dry type and should be installed outside the hazardous area. It may be considered as a special form of branch feeder. The primary winding should be connected to the main feeder, in the same manner, and with the same control and protective devices as any other branch feeder of the electrical installation. One side of the primary circuit should be grounded in an approved manner and the other side provided with an approved overcurrent device located outside the hazardous area. The primary winding should never be connected directly to a high voltage circuit. Both sides of the secondary circuit should be ungrounded and an approved overcurrent device should be provided in each side of every branch circuit connected thereto. Voltages across the ungrounded circuits should not exceed 115 volts.

In addition to the usual control and protective devices, the ungrounded system should be provided with a ground contact indicator consisting of a resistance of not less than 10,000 ohms connected across the secondary circuits. A relay, installed outside the hazardous area, should be connected with its winding between the midpoint of this resistance and ground. The relay should operate when either side of the secondary is grounded. Red and green signal lamps conspicuously installed should show the green light when no current is flowing through the relay winding and red when current is flowing and provide an indication of equipment or insulation failures.—G. R.

LIGHTING PLANT

Q. *Several years ago a nearby farmer had his property wired for connection to a proposed R. E. A. line. The line has not as yet been constructed, so he wants to purchase a 32 volt lighting plant to energize his wiring installation. While the original job has been approved, the local inspector claims that it must be completely revamped before a 32 volt plant can be used. Do you think it necessary to require this farmer to go to that expense?*—H. M.

A. It would seem that if the present installation is at all extensive, that this person should purchase a 110 volt lighting plant especially if the present lighting circuits consist of No. 14 conductors. With only a 32 volt generator, conductors, devices and equipment will have to have current ratings sufficient for the greater current required. For instance, the National Electrical Code requires that no conductors shall be smaller than No. 12 and an appliance circuit supplying more than a single outlet shall be No. 10 or larger, and that not more than 8 lamp holders or receptacles may be attached to a single circuit. It will therefore appear quite obvious that if a 32 volt plant is used the present wiring will have to be revamped considerably.—G. R.

OVERCURRENT PROTECTION FOR TRANSFORMERS

Q. *"Should overcurrent protection (fuses) be provided:*

A. When taps are made to feed transformers for control equipment on load side of motor starters? (110 or 220 V.)

B. When taps are made to feed transformers for control equipment on line side of motor starters? (110 or 220 V.)

1. When taps are less than five feet?

2. When taps are over five feet but less than 25 feet?

3. When taps are over 25 feet?

NATIONALLY PROMINENT in electrical inspector activities are (L to R) D J. Talbot, Chicago, past-president, Western Section, I.A.E.I. L. P. Dendel, Lansing, Mich., first vice-president, I.A.E.I.; and J. D. Lynett, New York City, president, I.A.E.I.

YOU CAN ALWAYS Rely ON RACO

RACO ALL-STEEL PRODUCTS

DIVISION OF

ALL STEEL EQUIP COMPANY

Do you know why so many electrical contractors prefer the Raco•All-Steel•Line? It's because they know, from years of experience, that Raco uniformly maintains its high-quality standards, that Raco is a mark of better materials and workmanship on their jobs. They know that it is a complete line—that there is a Raco product for every type of construction, for old and new buildings, for repair and maintenance jobs.

Actually more than 31 years of engineering experience and product improvement have kept the Raco•All-Steel•Line in step with the latest developments in the electrical field. It is a dependable line, a quality line—it is sold nationally only through electrical wholesalers.

Be sure—look for the Raco trade-mark—and remember, YOU can always RELY on RACO•ALL-STEEL!

← BLNO—*The BLNO is now equipped with a "sidemount" Bracket. An essential stock item.*

BLN—*The old favorite—but greatly improved. The new "BN" clamps plus embosses in box give full protection to Loom or Non-metallic Cables.* →

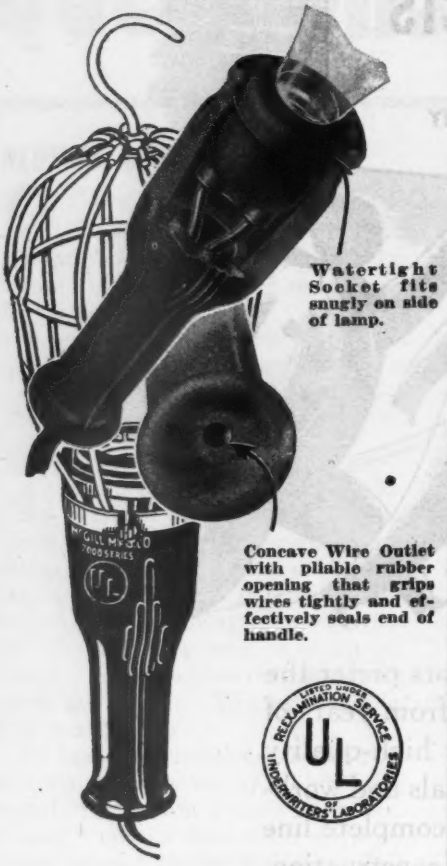
ALL-STEEL-EQUIP COMPANY, INC.
600 Kensington Avenue, Aurora, Illinois

RACO • ALL-STEEL • PRODUCTS

SWITCH BOXES • OUTLET BOXES • CONDUIT FITTINGS

Improved

for greater usefulness



Watertight Socket fits snugly on side of lamp.

Concave Wire Outlet with pliable rubber opening that grips wires tightly and effectively seals end of handle.

New Features for

Popular 7000 Guard Series

Guards in every sense of the word . . . the new McGILL 7000 Series protects not only light bulb but all connections to it.

Note in the illustration above the Watertight rubber socket and the rubber seal in the handle end . . . both of which prevent seepage of water and moisture to the interior. Connections, light bulbs, users . . . all THREE are protected by this new McGILL construction, every detail of which passes the rigid requirements of Underwriters' Laboratories. This guard can also be furnished with McGILL composition socket if desired.

There's a size and type for every need . . . in industrial plants, garages, railroad work, etc. Write for complete details.

McGILL MANUFACTURING CO.
Incorporated

VALPARAISO, INDIANA

Electrical Division

McGILL

Transformers are usually 40 to 100 watts. Control equipment is low voltage of the type used in heating, ventilating and air-conditioning."—L. D. B.

A. The primary question here is relative to the protection of the transformer to supply current to the remote control circuit of a motor as indicated above. There are also several other rather complicated matters involved in the whole subject of motor installation and protection.

The transformer involved in this case is generally of the bell-ringing type but may be of the signalling type and may be rated in the listings as a power transformer.

The bell-ringing type of transformer and generally also the other low voltage type usually have leads of No. 14 wire. These leads may need more protection than the transformer itself as a short circuit on the leads may be much more hazardous than a short in the fine wire comprising the windings of the transformer, which fine wires quite readily burn off.

The Code does not say anything definite about the protection of a transformer of this type nor of one used for the purpose stated above. This may be because such a transformer is generally placed on a No. 14 wire service and would of course be considered protected by a 15 ampere protective device. In this case the length of the service or of the tap would not have to be considered.

If the branch circuit which supplies the motor and also the transformer is larger than No. 14 wire and protected at over 15 amperes, we would be justified in asking that the transformer be placed on a circuit having 15 ampere protection; in other words on another circuit.

The location of the tap to the transformer, whether on the load side or on the line side of the motor protective device, must be given consideration, not so much to provide protection for the transformer but to not upset the overcurrent protection to be provided for the motor.

In the class of equipment mentioned in the question, we are dealing with a motor and its controls and protection, in the fractional horse power automatically started type where the motor protection is required to be less than 15 amperes.

We must therefore see to it that the current drawn by the transformer will not require the use of a protective device larger than that specified for the motor (140 percent of the running current of the motor). This might happen if we connect the transformer on the load side of the motor protective device (or starter).

In some installations one or two other control transformers may be used and sometimes also an ignition transformer. This latter is very apt to be connected at the same point as the motor leads and would therefore be on the load side of the motor protective device. If all of these transformers were connected to the circuit on the load side of the motor protective device, the motor protection might be seriously affected. It is therefore better to connect the transformers on the line side.

There is, however, an exception to the above, and that is where the motor is protected by an inherent overheat protective device built into the motor. In this case, the only overcurrent device required would be the motor circuit protective device at 15 amperes and in which case the transformer or transformers could be connected anywhere on the circuit.

All of the above relates to fractional horse power motors which, as mentioned above, are placed on 15 ampere branch circuits. When we get to larger motors, on circuits of greater capacity, the problem of protection for the transformer becomes a little more involved and the code rules are not sufficiently definite on the matter. However, it seems to this writer that transformers of the type used to supply currents to control circuits, should have protection of not over 15 amperes. Of course with this provision, the length of the tap does not need to be considered as it does not fit into the stipulations given in Section 2434 c and d.—F. N. M. S.

METAL BOXES

Q. *"A new housing project is now under way in our city, and we understand that some kind of a concrete asbestos water main has been installed throughout this area. We wish to enter our bid for wiring these homes but understand we cannot use metal boxes if the houses are wired with non-metallic sheathed cable as required by the specifications. Is this a Code requirement?"*—L. W.

A. Yes, the non-conductive type boxes will have to be used. Section 3716 of the National Electrical Code was revised by Interim Amendment No. 49 on June 17, 1942, to read as follows: "Non-metallic outlet boxes may be used only with open wiring on insulators, concealed knob-and-tube work, non-metallic sheathed cable and non-metallic waterproof wiring, and *shall* be used when such wiring systems are installed on premises where a continuous underground metallic water piping system is not available as a grounding electrode."

Photo courtesy Electrical Contracting; Installation—Sperry Gyroscope Co., Nassau Plant, Lake Success, N. Y.

CORNING ENGINEERED LIGHTING *HELPS YOU SELL . . .*

BETTER ILLUMINATION TO PLANT ENGINEERS

Engineers agree that Corning *Flur-o-guides* are a practical means of securing the high levels of illumination needed for efficient lighting to meet today's increased production requirements. You can explain to them in their own language how these correctly designed *Flur-o-guides* provide adequate, uniform illumination over a wide area and eliminate glare and "dark" spots. Their decorative design fits well into today's architectural treatment.

Corning Lighting Engineers will be glad to work with you on any lighting problem you may have.

Corning Glass Works does not manufacture or sell lighting fixtures. Complete standard fixtures are obtainable from electrical fixture manufacturers.

CORNING FLUR-O-GUIDES PROVIDE ENGINEERED LIGHTING FOR SPERRY GYROSCOPE COMPANY

This view of the drafting room at Sperry Gyroscope Company's new Nassau plant shows how thorough, uniform illumination can be secured over wide areas through the use of Corning *Flur-o-guide* Lenses. Recessed troffer units, in continuous rows, equipped with *Flur-o-guide* Lens Panels, Code No. 90818, were used in this installation. Two 40 watt fluorescent lamps are mounted in each unit. Placed on five foot centers, this installation provides uniform lighting of approximately 80 ft. candles on the work area, with adequate shielding from light sources.

Send for a copy of "Corning Lighting Data." It contains specifications and applications on the complete line of engineered Corning *Flur-o-guide* Lenses and Panels. Address Lighting Sales Dept.,EC11, Corning Glass Works, Corning, N. Y.

ORNING means ...ch in Glass

Corning Engineered Lightingware

Dependable Protection

MONARCH FUSE COMPANY, LTD.

116 E. FIRST STREET JAMESTOWN, N. Y.

The use of non-conductive water mains brings out another Code problem for the contractor. On this type of water main system the service pipe from the main to the building is usually copper tubing, so it has a certain amount of grounding value and in fact will in most cases offer less resistance to earth than the standard driven ground. Few contractors are equipped with proper instruments for the measurement of resistance to earth, so rather than take a chance on the service piping they invariably ground the neutral at the service to a driven rod and then fail to provide a connection between the neutral and this water service pipe. This results in a rather hazardous condition in many instances due to the difference in resistances of the two grounding mediums and will result in injury to persons or equipment. In all cases where this condition is encountered, be sure that the water service piping and the neutral are electrically connected by a standard grounding conductor.—G. R.

GROUNDING PORTABLE TOOLS

Q. *"What is the minimum size permissible for grounding portable electrical tools?"*—M. C.

A. The answer to this question is found in Section 2596 of the National Electrical Code. A No. 18 copper wire may be used if the equipment to be grounded is supplied through a circuit protected by fuses or circuit breakers having a rating of 15 amperes or less. For portable tools protected at from 16 to 30 amperes the grounding conductor must be No. 14 and for tools protected at from 31 to 60 amperes the grounding conductor must be No. 10 or larger.—G. R.

SWAPPING EXPERIENCES at Western Section, I.A.E.I. meeting are (L to R) Glenn Rowell, electrical engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn., and Clifford Anderson, chief electrical inspector of Oklahoma City, Oklahoma.

MEET THE DEMAND WITH ILLINOIS

COMPLETELY INSULATED

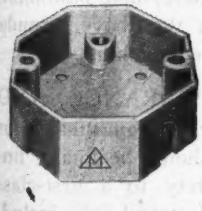
ALL PORCELAIN WIRING SYSTEMS . . .

PORCELAIN CONFORMS TO THE NATIONAL ELECTRICAL CODE

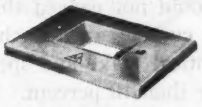
TOGGLE SWITCH PLATE

Look for this Trade Mark

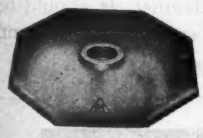
STANDARD TUBES



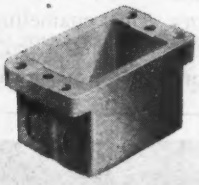
STANDARD KNOBS



SWITCH BOXES AND COVERS



OUTLET BOXES AND COVERS



DUPLEX RECEPTACLE COVER

CLEATS

★ Contractors everywhere know that Porcelain in large quantities is available —that, therefore, they can do wiring jobs today with no let down in wiring quality —that they still can assure customers of permanency, dependability, and economy—that simplified modern installations are the result of the use of All Porcelain Wiring Systems.

This all means continued business for you — wiring goes right along — porcelain products are in demand. So, as those calls come to you for porcelain, be sure you are prepared with ILLINOIS PORCELAIN.

No vital materials go into the production of porcelain, materials do go into porcelain that make these systems durable— that are not affected by rust or corrosion — that make possible full safety — that make these systems valuable where there is dampness and fire hazard.

Illinois all porcelain wiring systems are adaptable to practically all wiring plans and layouts. They can be installed without grounding.

Illinois ELECTRIC PORCELAIN CO.

MACOMB, ILLINOIS

Rebuilt Electrical Equipment Standard

[FROM PAGE 42]

16. A-C STATORS AND SLIP RING ROTORS—*Electrical*—Windings should be free from open circuits, short circuited coils, and cut-out coils; free from short circuits between coils and phases; free from grounds; and should have all connections properly soldered or welded and secured. All coils should be properly dipped and baked with a good grade of varnish to make the winding solid, oil and moisture resisting.

17. ROTORS (SLIP RING AND SQUIRREL CAGE)—*Mechanical*—All conductors should be tight and secure in the slots with proper slot wedges. All conductors should be secure and soldered or welded; all bands properly soldered, snug, secure and insulated from the winding which they cover. The rotor laminations should be solid and secure on the rotor spider and likewise on the shaft.

Slip rings should be solid, secure, properly insulated, and have sufficient stock to be mechanically strong.

18. ROTORS (SQUIRREL CAGE)—*Electrical*—End ring connections should be thoroughly and completely soldered or preferably brazed, and be free from open circuits.

19. D-C FIELDS (ROTATING AND STATIONARY)—*Electrical*—Field coils should be tested when hot for voltage drop over each coil, and coils should be rewound or replaced when such voltage drop measures less than 85 percent of that coil's corresponding *normal* share of the line voltage. Compound winding should be well insulated and free from short circuits with shunt winding; compound windings, and also interpole fields should be free from short circuits. All fields should be free from grounds.

20. D-C ARMATURES — *Electrical*—Armature winding should be free from open circuits, short circuited and cut-out coils, short circuits between coils and grounds. All connections and leads should be properly secured and winding dipped and baked with a good grade of varnish to make same solid, oil and moisture resisting.

21. COMMUTATORS — Commutators should be solid, tight on the shaft, and accurately machined concentric with shaft; free from carbonized and short circuited segments and grounds. When copper stock is less than 50 percent of its original amount, customer should be notified of same.

Mica should be left flush or undercut as determined from the grade of mica, the grade of brush, and from the design, purpose and type of unit.

22. BRUSHHOLDERS AND BRUSHES—All brushholders should be thoroughly cleaned, uniform in size, equipped with an adjustable brush tension device, and proper adjusting springs and devices in good order.

Brushes of all types should be the correct size and grade for the make and type of machine in which they are installed, and should have at least 50 percent wearing stock remaining when sold.

Tests

23. IDLING OR EXCITING CURRENT—The idling or exciting current in a-c motors should not exceed by more than 10 percent the original exciting current for motors of identical make and specifications. The phases must be in balance to within 20 percent between the high and low phase reading when uniform voltage is applied.

24. FULL LOAD CURRENT — The full load current of any piece of equipment should not exceed the normal full load current of a machine of the same identical make and specifications by more than 10 percent. In the case of two and three-phase motors and generators, full load currents in the different phases should not vary more than 20 percent between the high and low phase reading.

25 INSULATION RESISTANCE—The insulation resistance between windings and the frame. as well as between all the current carrying parts and the frame, should be the safe minimum value for insulation resistance of electric motors as determined by the AIEE recommended formula:

$$\text{Megohms} = \frac{\textit{Rated Voltage of Machine}}{\textit{Rating in kva.}} + 1000$$

These values are:

For a 220 volt motor—0.2 megohms

For a 440 volt motor—0.4 megohms

For a 550 volt motor—0.5 megohms, etc.

While the above are the AIEE standards, many insurance companies will not accept any electrical equipment where the megohm reading is below one megohm regardless of the voltage and size of the machine. Since this is the case, and it is admitted some rebuilt motors may need to be insured by the customer, *it is deemed advisable to set a standard of a minimum of one megohm insulation resistance value as the acceptable minimum,* in the cases where the above formula equals less than one megohm.

26. FINAL APPEARANCE AND SHIPPING—*The Reconditioned* or *Rebuilt* machine should be finally finished in its entirety to a first-class mechanical and electrical job, including enameling of frame. It should be well skidded or crated for shipment, with all fragile parts protected.

BROWN ELECTRIC CO., at Little Rock, Arkansas is a father and son combination with Walter M. Brown (left) and his son Clyde handling the motor repair business.

It's time for FOUNDATION-BUILDING

for TOMORROW'S *great Electrical job*

ELECTRICAL CONTRACTORS face new conditions that call for a stronger underlying structure for their operations than ever before. "Just planning" isn't enough—it's time for *foundation-building* to make ready for fast action on the changeovers ahead.

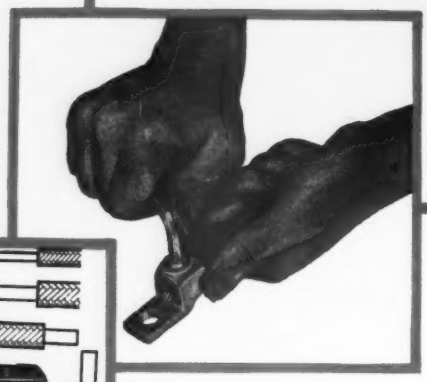
New tools, new methods, the application of new materials, new concepts of what a fully electrified building requires, new efficiency in choosing and installing specialized equipment—these are only a few of the foundation stones on which tomorrow's profitable business must be built.

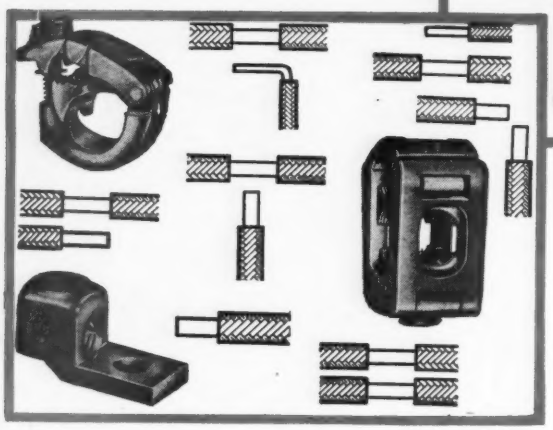
Right now, Graybar and its associated suppliers are ready to help you start your foundation-building. You can get a line-up on new time-saving tools, and be fully informed on modern installation practices that will match-up with 1945-50 construction. "Via Graybar", you can also get the facts that will help you sell your prospects on the advantages of relighting, rewiring and re-equipping electric systems neglected since the war began.

NEW SUPPORT FROM THE GROUND UP.. *via* GraybaR

ADEQUATE WIRING SERVICE

Stock up for Re-conversion Wiring





T&B LOCK-TITE PRESSURE CONNECTORS

The T&B Lock-Tite way to button up any kind of cable is simplicity itself.

Insert your cable—solid, stranded, flexible, extra flexible, hemp-core, rod or tubing in any one of these versatile fittings. Tighten with key wrench or screw driver.

No solder to fuss with.

Approved by Underwriters Laboratories. They make positive, dependable, vibration-proof electrical connections.

A handful of assorted size Lock-Tites will take care of practically all your tapping and lugging requirements up to 1,000,000 CM. 100% salvage value.

Be forehanded. Place your order now.

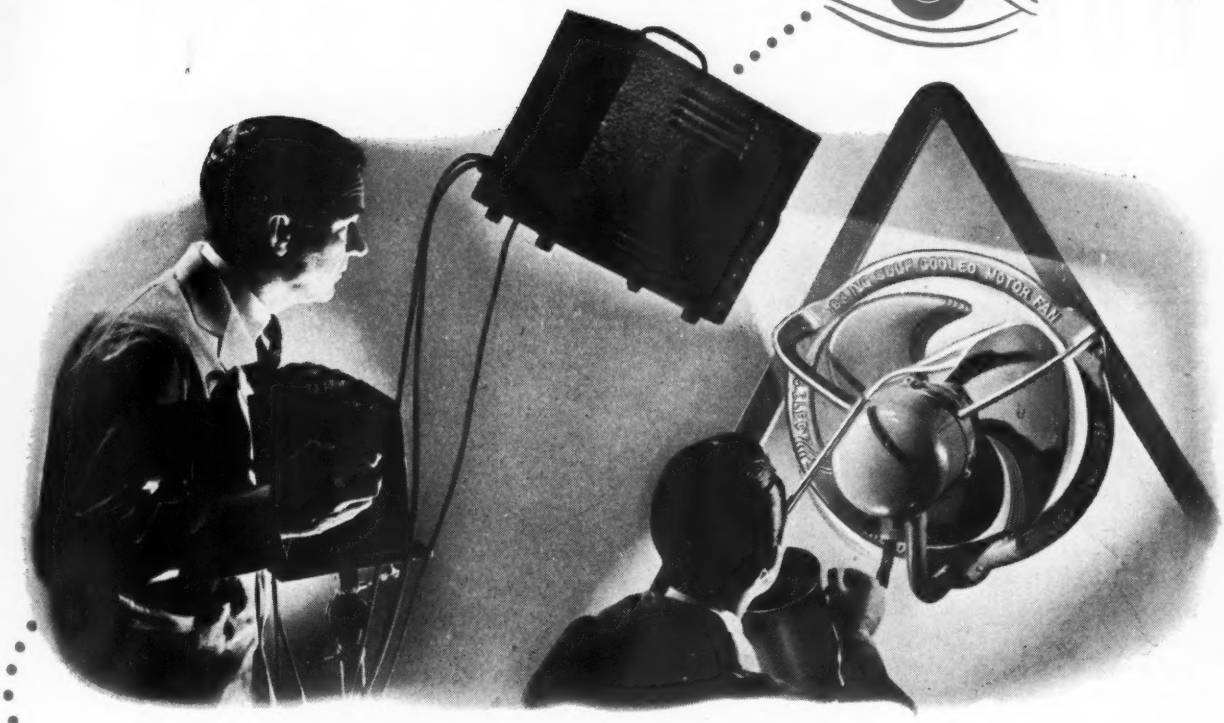
Stocked and sold under the T&B Plan through T&B Electrical Wholesalers exclusively.

THE THOMAS & BETTS CO.
INCORPORATED
manufacturers of electrical fittings since 1899
ELIZABETH, 1, NEW JERSEY
In Canada: Thomas & Betts Ltd. Montreal

It's time for FOUNDATION-BUILDING

ADEQUATE WIRING THE KEY TO THE HOMES OF TOMORROW

KEEP YOUR EYE ON ILG



For Important Post-War Developments

Intensified research during the war period, coupled with amplified personnel and facilities (including a new research laboratory) have paved the way for new ILG developments to be announced soon. No miracles . . . these are sound, practical engineering achievements in improved design, increased efficiency, new applications. Make certain that you are on the list to receive first news about these important developments by writing us or phoning nearby ILG Branch Office (see classified directory).

ILG ELECTRIC VENTILATING CO., 2879 N. CRAWFORD AVE., CHICAGO 41, ILL.

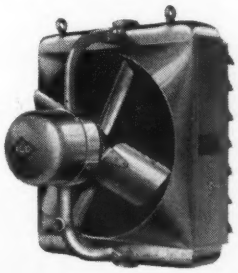
OFFICES IN 38 PRINCIPAL CITIES

ARMY E NAVY

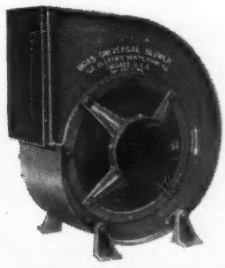
ILG

VITALIZED VENTILATION

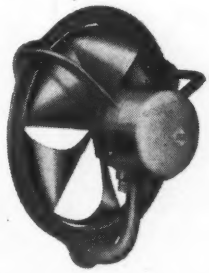
AND AIR CONDITIONING



ILG Steam or Electric Unit Heaters



ILG Direct-Connected Blowers



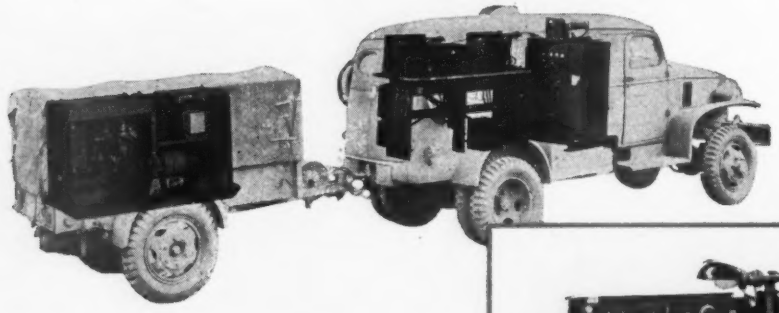
ILG Self-Cooled Motor Propeller Fans

New support from the ground up.. via GraybaR

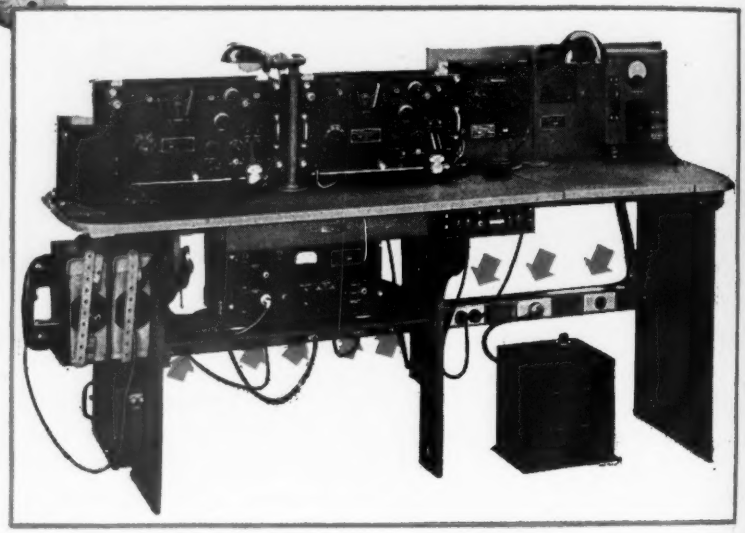
HUBBELL *Twist-Lock* DEVICES

2-3-4 WIRE . . . . . 10-20-50 AMPERES

PROVEN BY "ROUND-THE-CLOCK" SERVICE



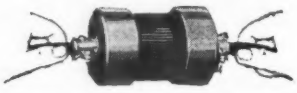
ON THE SCR-299
This famed communications unit of the U. S. Army Signal Corps uses numerous "Twist-Locks" for plug-in connections.



Twist-Lock Connecting Devices meet all requirements for continuous uninterrupted service in the operation of electronic equipment by providing a locked electrical connection. Positive, mechanical engagement of the cap contacts within the receptacle make accidental pull-out impossible. "Twist-Lock" Devices are properly polarized and grounded for complete protection.

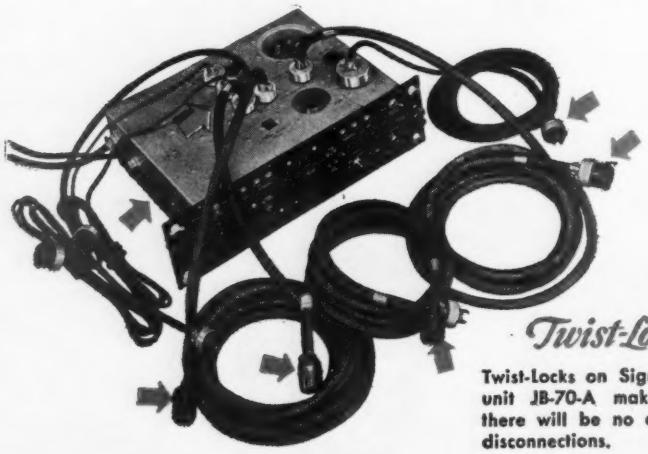
Proven by "round the clock" service in today's war plants, and on the far-flung battlefronts. "Twist-Lock" will provide an uninterrupted power supply for tomorrow's industrial world.

Look to Hubbell for the finest in wiring devices . . . time-proven . . . battle-tested.



They Never Disconnect Accidentally

PLUG IN . . . TWIST . . . THEY'RE LOCKED AND A TWIST OF THE WRIST UNLOCKS IT.



Twist-Lock
Twist-Locks on Signal Corps unit JB-70-A make certain there will be no accidental disconnections.

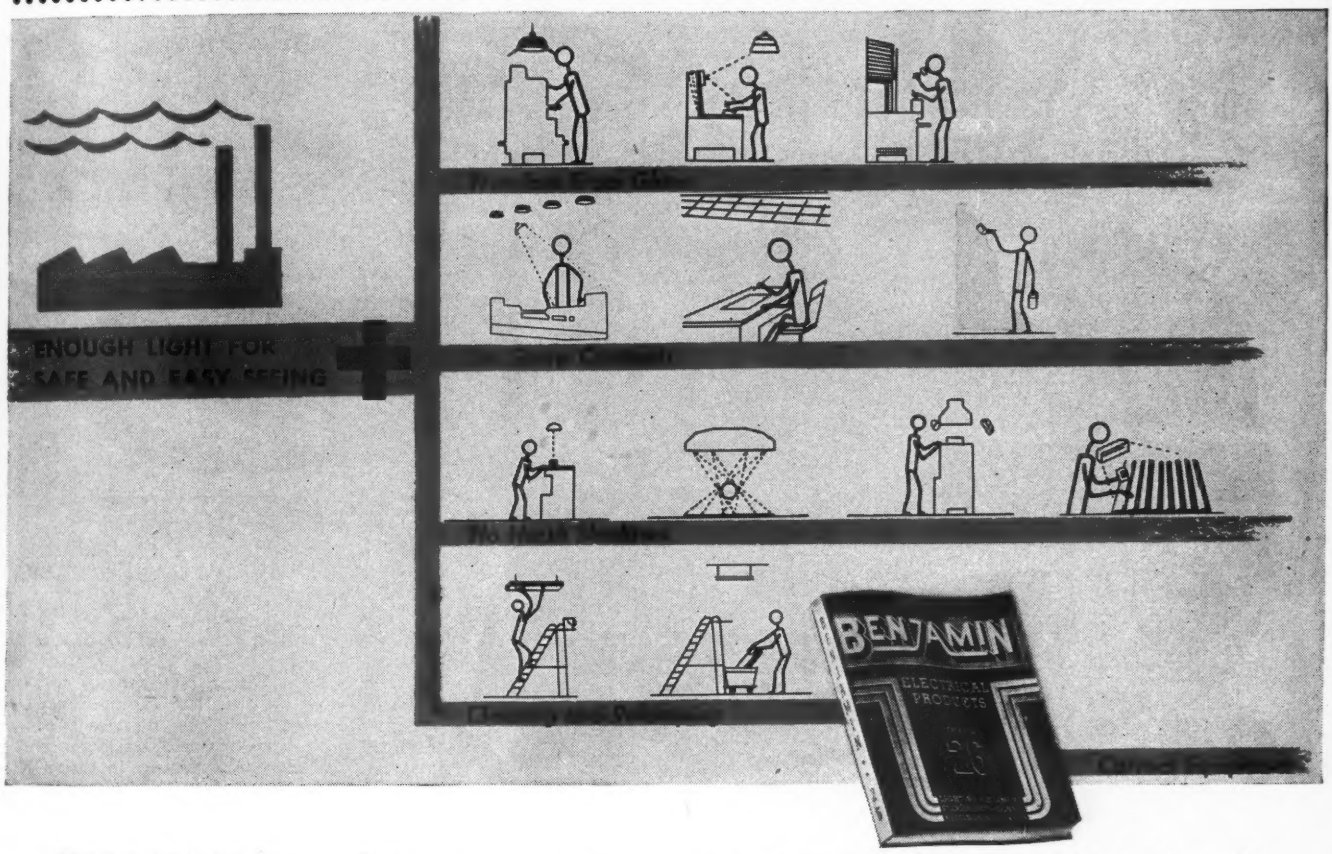
Twist-Lock
Twist-Locks in gangs on this amplifying unit provide positive connection for power supply.

HARVEY HUBBELL, INC. HUBBELL **BRIDGEPORT, CONN.**

FOUNDATION-BUILDING

PREDATE WIRING — THE KEY TO THE HOME OF TOMORROW

How does Your Lighting Check Up with Today's Higher Standards?



ONLY a job by job, department by department analysis of your lighting can determine the answers to the question: "How Does Our Lighting Check Up with Today's Accepted Standards?"

Such a check up will reveal:

1. **Are we providing our employes with the necessary light for easy and comfortable seeing?**
2. **Where and how can annoying direct and reflected glare be reduced?**
3. **What must be done to the lighting and to the working surfaces, the walls and ceilings to reduce sharp brightness contrasts which interfere with good seeing?**
4. **Where must sharp shadows be eliminated?**

Much of your production efficiency depends upon the proper answers to these questions. Lighting that meets today's higher illumination standards . . . that eliminates irritating glare and uncomfortable brightness can also be an important influence for better labor relations.

You can be sure of obtaining maximum results from your lighting by specifying Benjamin Lighting Equipment. Such specification assures you of lighting that conforms to all recognized industry standards through lighting equipment that is scientifically designed to provide proper shielding, adequate diffusion and efficient direction of light where most needed.

Without cost or obligation on your part, let us place your name and the names of your associates on our list of those to receive the various Benjamin bulletins and other data to be made available during the next few months. These will be helpful to you in making a study of your lighting and in planning needed improvements. Just write Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Illinois and ask for Benjamin Re-Lighting Service Data.

BENJAMIN TRADE MARK

Lighting Equipment

Distributed Exclusively Through Electrical Wholesalers

New support from the ground up . . via GraybaR

Proved Aids to PROFIT IN THE SHOP and ON THE JOB!

IN THE SHOP...

Typical of electric tool improvements by Thor is this new *"Armored-in-Plastic"* ¼-inch drill which is fully 14% lighter than comparably rated old-style drills . . . yet equally as powerful. Proved under toughest production conditions, it stands up for long service on all shop and installation jobs. You can get them now for bench and tool kits. Ask for details.

How *Thor* Portable Electric Tools *Save you Time and Money*

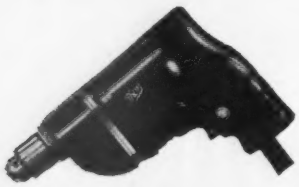
TIME Saving, ease of handling, economy per job—all are vital factors to consider when planning on the tools you'll use to help you do *tomorrow's* work more profitably.

Thor engineers, too, considered these factors in designing THOR portable electric tools . . . to achieve compact power combined with light weight to do scores of jobs faster. Greater power with ease of handling gives you more efficient performance in Thor electric tools for all types of light and heavy duty drilling, hammering, screw and nut driving, grinding, sanding and sawing.

ON THE JOB...

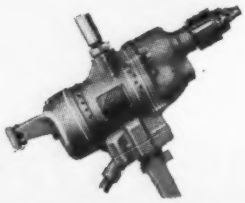
For installation, renovation and construction jobs; for maintenance and repairs, there are hundreds of jobs of drilling, channelling, demolition, shaping and cutting in stone, wood and metal that this powerful Thor electric hammer will do better and faster. Just 14 pounds, it has a capacity in concrete up to a 1-inch star drill . . . a stronger blow than any hammer of comparable size. It's a tool "must" for tomorrow that you should get the facts on *today*.

POWER WITH LIGHT WEIGHT to do Scores of Jobs Faster



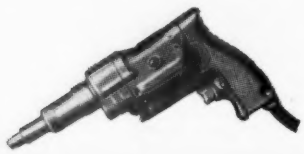
SMALL CAPACITY DRILLS

Thor offers double the range of "midget" type, one hand drills availat anywhere.



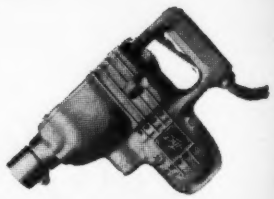
LARGE CAPACITY DRILLS

Powerful models, lighter and less bulky, in capacities up to one and one-quarter inch.



SCREWDRIVERS & NUT SETTERS

Screwdrivers in capacities up to No. 20 screws and nut setters up to one and one-half inch nut.

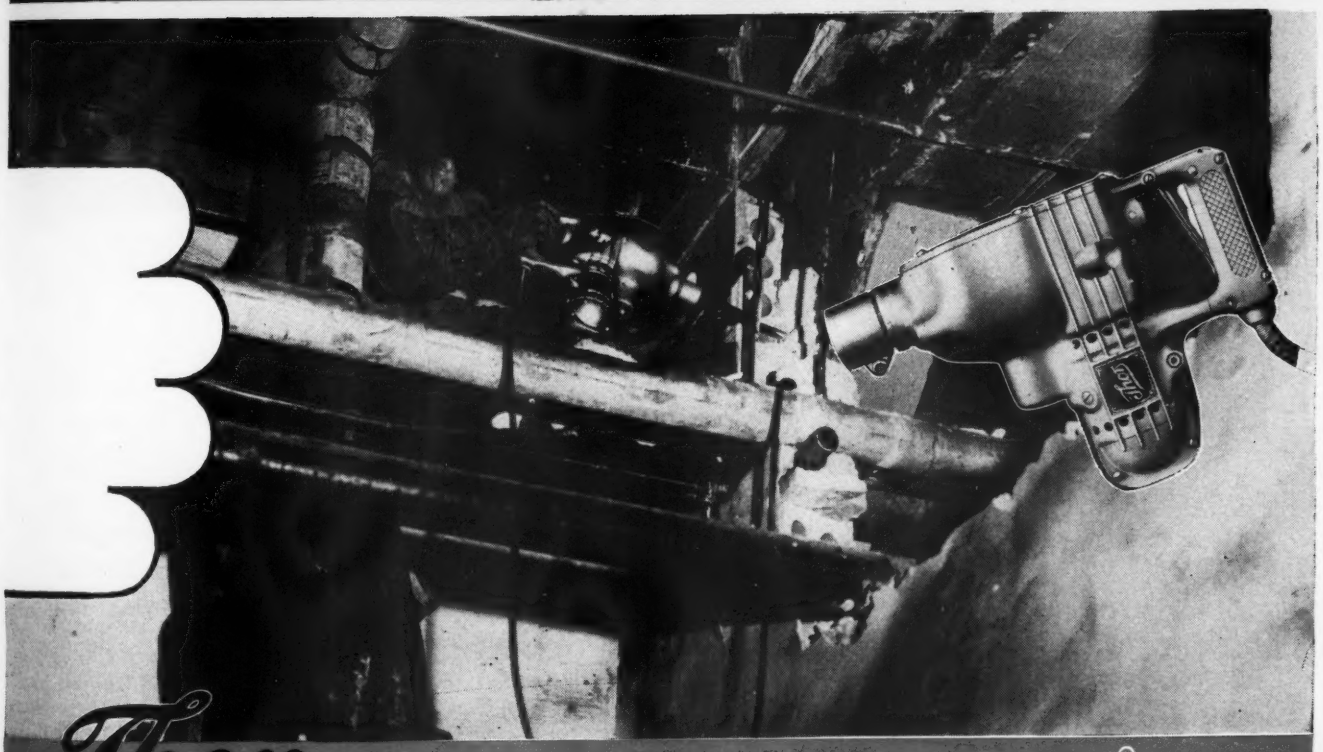


HAMMERS

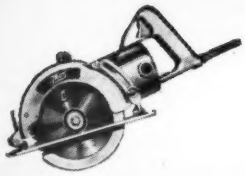
With the "Sling Shot Drive", Thor hammers have unequalled power for heavy duty work.

It's time for FOUNDATION-BUILDING

ADEQUATE WIRING THE KEY TO THE HOME OF TOMORROW



Thor PORTABLE ELECTRIC TOOLS



SAWS

Models for quick, safe operation on every type of job. Capacities from 6" to 12" blades.

GRINDERS, SANDERS, POLISHERS

Smooth operating, easy handling models in a wide range for light and heavy duty.

Thor *Portable Electric Tools*

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W JACKSON BOULEVARD, CHICAGO 6, ILL.

Branches in Principal Cities

THOR'S productive efforts today are devoted entirely to the task of supplying portable tools to the armed forces and war industries.

New support from the ground up.. via GraybaR

A COMMERCIAL LIGHTING SWITCH

Only 1⅜ inch deep

RUGGEDLY BUILT
EASILY WIRED
EASILY INSTALLED

The Bryant Switch No. 4961 is T rated at 10 amps., 125 volts. It will give you the dependable, easily installed shallow type switch you need for lighting loads in banks, hospitals, hotels, apartments, theaters, schools, and office and industrial buildings. Mechanism is enclosed in rugged composition housing and insulated from yoke. Performance records indicate that mechanical failures are almost unknown. It will give long uninterrupted service under exacting load conditions. Meets all specifications, including Federal. For commercial lighting installations, order Bryant No. 4961.

Specify Bryant Devices from your Electrical Wholesaler

ARMY (E) NAVY

THE BRYANT ELECTRIC COMPANY

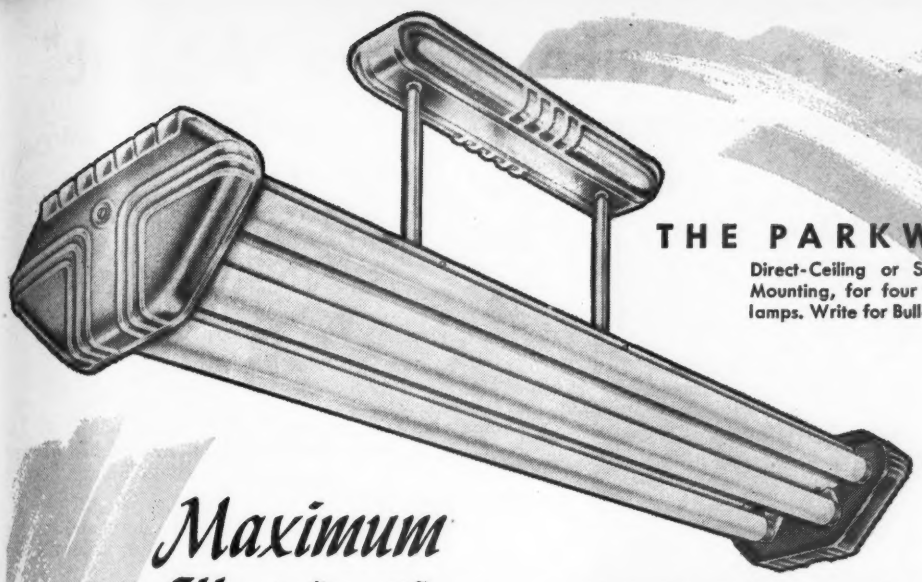
BRIDGEPORT 2, CONNECTICUT

NEW YORK SAN FRANCISCO CHICAGO LOS ANGELES

BRYANT

SUPERIOR WIRING DEVICES

It's time for FOUNDATION-BUILDING



THE PARKWAY

Direct-Ceiling or Suspension Mounting, for four 40-watt lamps. Write for Bulletin F-80.

The Sign of Quality
Look for this Label

DAY BRITE

Maximum Illumination — WHEREVER LIGHT IS A FACTOR

For suspension or direct-ceiling mounting in work areas, administrative and engineering offices—these Day-Brite lighting units can be easily maintained at the peak of their original efficiency.

The PARKWAY is an open-type fixture, with die-formed ends finished in baked lustre aluminum enamel. Accessible for easy, quick cleaning—lamps removable without disturbing ends.

The CORONADO is a shielded type unit with ribbed diffuse glass side panels. Louvered bottom prevents bug catching—makes cleaning easy. The entire enclosure is held in place by spring-suspension clips and service chains—can be attached or removed in less than 5 seconds.

All reflecting surfaces and louvers are finished in baked SUPER-WHITE enamel... Both types are complete with all necessary fittings, ready for quick installation.

THE CORONADO

Direct-Ceiling or Suspension Mounting, for four 40-watt lamps. Write for Bulletin F-80.

DAY-BRITE INDUSTRIALS

Send for Bulletins F-76 and F-77. They illustrate and describe the complete industrial line.

Consult your nearest Day-Brite Engineering Representative . . . Write for Bulletins.

Day Brite
LIGHTING FIXTURES

DAY-BRITE LIGHTING, INC.
5436 Bulwer Avenue • St. Louis 7, Missouri

80

New support from the ground up.. via GraybaR

"Something To Write Home About"

U. S. Signal Corps Photo

TIREX
SELENIUM
Rubber Armor
Unequalled for Long Life Toughness and Resistance to Abrasion

Somewhere in Europe:
"I have seen Simplex wire and cable aboard several different airplanes in which I have flown."

New Guinea:
"During my travels I have seen lots of Simplex wire. It is all over the world. Everywhere I see reels of it."

Africa:
"I take great pride in using Simplex material because I know the effort all the gang back at Simplex use to make it the best."

Italy:
"I have seen a great deal of Simplex products in different campaigns over here. Without this equipment, a hard job would have been much harder."

England:
"I have seen plenty of Simplex wires here."

Alaska:
"All of us service men would like nothing better than to give our whole support to help you out back there at Simplex. We need the wire and cable."

Hawaii:
"Congratulations on the honors that have been bestowed on you. On one of the trips by ship I had the watch with earphones. I noticed the label on the cord said 'Simplex-TIREX.'"

Egypt:
"Here in the depot I get a chance to see many Simplex products, wire, cable and even throat microphones made at Sidney Street. Simplex products were at the Cairo Conference not so long ago. They do get around, don't they?"

Iran:
"The first thing I handled over here was 'TIREX' put out by 'The Simplex Wire and Cable Co. in Cambridge.'"

In the South Pacific:
"We are using a lot of your cable throughout our ships."

Wherever our fighting men have landed on foreign soil enormous quantities of Simplex-TIREX flexible cords and cables have gone ashore with them. They know it is good and they write home about it.

When you need a portable cord or cable to help along your war work — specify Simplex-TIREX.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

ARMY E NAVY

Simplex
WIRES and CABLES

It's time for FOUNDATION-BUILDING

ALTERNATE WIRING — THE KEY TO THE HOME OF TOMORROW

NO MORE "COCK-EYED" MOUNTINGS

NO SHIMS NEEDED

NO "DROPPED" BOXES

NO TRIM TOUCH-UP NECESSARY

New designs that make it easier for you

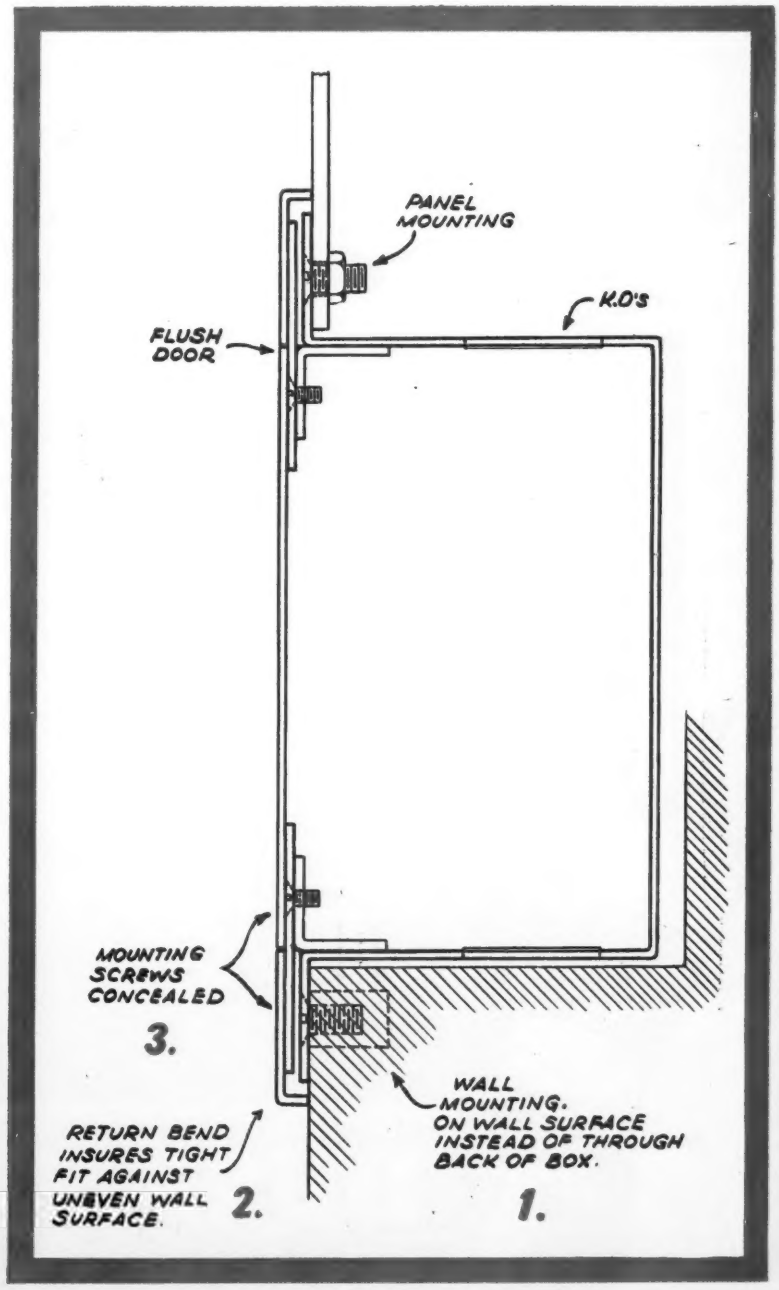
• Edwards postwar electrical signaling equipment has been re-designed—now it will be not only the *best*, but the *easiest* to install. New designs eliminate the need for special installation skills, give neater results, cut your costs and save time.

Take a simple flush annunciator case—always a headache to install because of the time and trouble to cut an exact size opening, line up the screws at the back, and difficulties due to varying wall thicknesses.

The new Edwards flush annunciator mounting eliminates these annoyances. So simple to install that even an untrained helper can do it. The case acts as its own template—just lay it against the wall, then punch holes. Can be used on walls of any thickness, from ⅛" up. The sharp edge of the trim results in a completely flush installation, no mounting screws are visible.

Corresponding improvements will be found in all Edwards signaling equipment—postwar sunshine and profits for contractors.

EDWARDS and COMPANY, NORWALK, CONN.



1. Wall mounting on the wall surface instead of through the back of box.

2. Return bend insures tight fit even on uneven wall surfaces.

3. Concealed mounting screws.

EDWARDS

SINCE 1872

ELECTRICAL SIGNALING

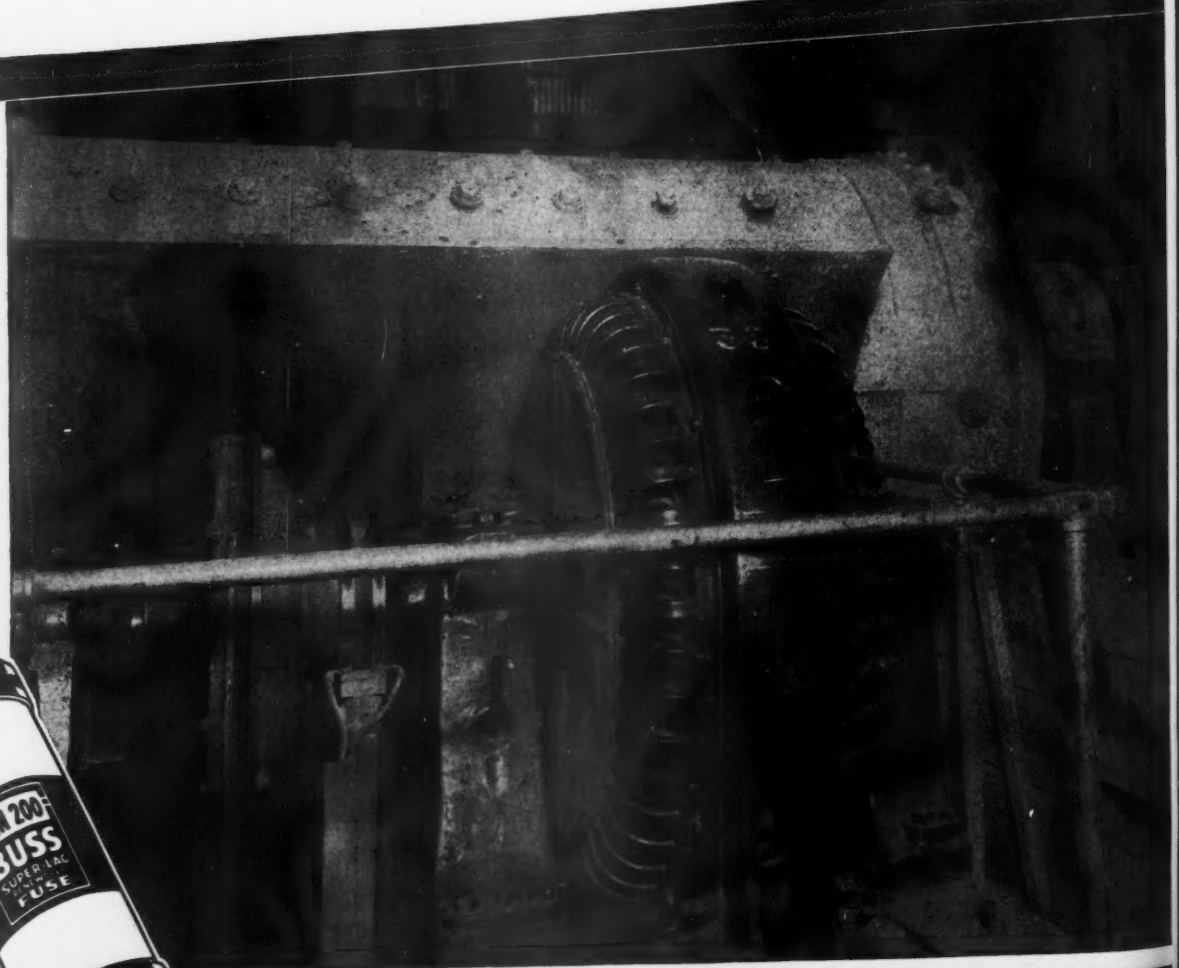
Bells · Chimes · Telephones · Alarms

for Homes, Offices, Schools, Hospitals

New support from the ground up .. via GraybaR

"We Reduced Fuse Maintenance and Eliminated Costly Shutdowns —on our Tube Mill with BUSS Super-Lag Fuses"

Reports Mr. H. W. Smith, Vice Pres. in charge of Operations
Riverton Lime & Stone Co., Riverton, Virginia



BUSS SUPER-LAG

SOLD THROUGH WHOLESALERS

It's time for FOUNDATION-BUILDING

Mr. Smith explains—"Several years ago costly shutdowns on our tube mill were occurring much too frequently due to fuses blowing. A salesman suggested that BUSS Super-Lag fuses might correct the trouble. After installing them we stopped having needless fuse blows. We credit the long time-lag of BUSS fuses with preventing these interruptions of our production as well as with greatly reducing our fuse maintenance costs."

TIME AFTER TIME in plant after plant, the use of BUSS Super-Lag fuses has reduced fuse maintenance, saved production time, saved money, and kept production up. You, too, can get the same result by using BUSS Super-Lag fuses. The experience of the Riverton Lime and Stone Company is one of a long list of successful installations that proves that fuse blowing on harmless overloads can be reduced by using BUSS Super-Lag Fuses.

BUSS fuses require no maintenance or periodic inspection. They don't open needlessly. If one opens, you can be sure some condition needs correction. When one opens, it requires less than 45 seconds to renew with an inexpensive link.

Here is why BUSS fuses greatly reduce or entirely prevent needless blows

The fuse case is designed to insure good contact on the link, even when the fuse is renewed by an inexperienced person—and it is so designed that vibration or heavy overloads or the constant heating and cooling of the fuse will not permit poor contact to develop. Thus excessive heating which causes fuses to blow needlessly is prevented.

The fuse link used is the famous "BUSS Super-Lag." It has lag-plates attached to it. These give it a time-lag so long that it will reduce to an extent not possible with any other renewable fuse, the number of Shutdowns caused by needless fuse blows.

How to solve the "shutdown problem"

Pass the word along that all purchase records dealing with circuit protective devices should be immediately changed to call for BUSS Super-Lag Renewable fuses. Then, as fuses are replaced or new installations made, your plant will automatically get the benefit of the carefree, trouble-proof protection that BUSS Super-Lag fuses afford.

BUSSMANN MANUFACTURING CO., University at Jefferson, St. Louis, Missouri.
Division McGraw Electric Company.

Why BUSS Fuses Don't Blow Needlessly

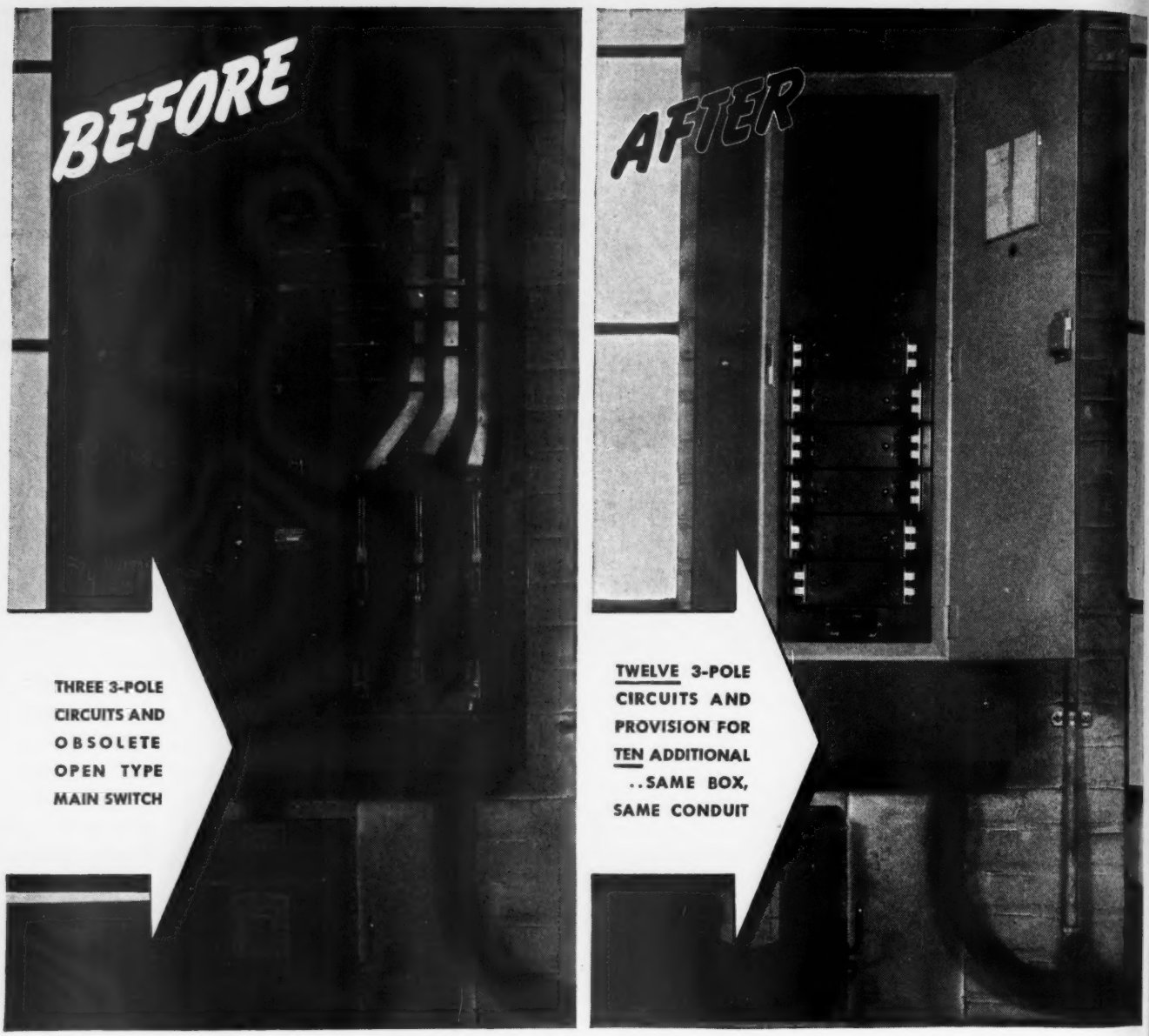
10 FEATURES in the design of the FUSE-CASE help make it possible.

and

The SUPER-LAG development in the FUSE-LINK completes the job.

FUSES

New support from the ground up .. via GraybaR



HERE IS A TIMELY SOURCE

of Profitable Industrial Business

● Increased production has brought the demand for more power distribution in scores of plants. There are countless fusible panels similar to the one shown at the left above—inadequate and subject to excessive heating.

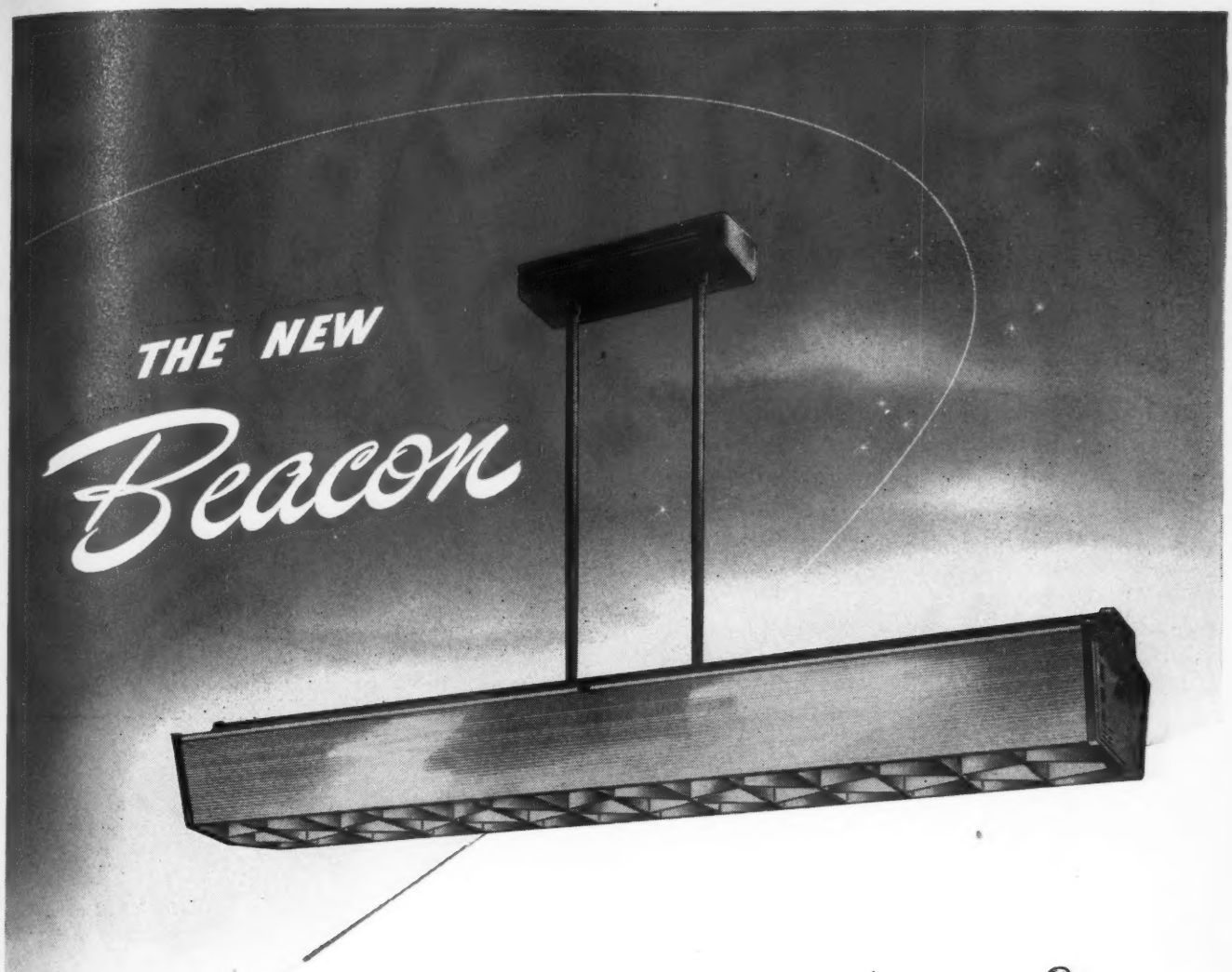
Notice how easy it is to convert to a compact, dead front circuit breaker panel. Notice, too, that by the utilization of thin wall wire, additional circuits have been provided, at the same time using existing box and conduit.

Why not go after this kind of conversion business? There's a lot of it to be had.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

It's time for **FOUNDATION-BUILDING**



...FOR BETTER LIGHTING IN OFFICE OR DRAFTING ROOM

The Wakefield BEACON is built to standards you'd expect from Wakefield; offers top efficiency, along with lower cost.

A Certified Fleur-O-Lier, the BEACON is designed to combine high quality fluorescent lighting with simple, modern appearance. It's a "honey" for essential office or drafting room. Postwar, it can be a decided help for stores and other commercial interiors.

Maintenance is especially easy. There are no horizontal surfaces on which dust can collect.

New rigid louvers are hinged to make lamp replacement easy. Has twist-type sockets mounted with slot *up*, so lamps cannot fall out.

Etched, ribbed glass on the side panels gives smooth, diffused light. All-steel construction, finished in lustrous satin zinc, with white enamel reflecting surfaces. Pierced metal end caps are backed up with translucent plastic. And you can supply this 4-lamp fluorescent unit in stem suspension as pictured, or with close-up mounting for low-ceiling areas.

Help your customers handle paperwork faster, reduce eye-strain . . . with the BEACON. Get the details now from your Graybar house or write us.

ASK YOUR GRAYBAR HOUSE ABOUT LIGHTING EQUIPMENT BY

Wakefield

THE F. W. WAKEFIELD BRASS COMPANY • VERMILION, OHIO

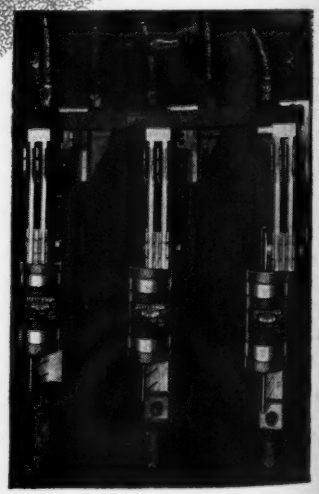
New support from the ground up . . via GraybaR

Prompt Fuse Shipments NOW

The high standards set by the Army and Navy were no novelty at Jefferson Electric because Jefferson-Union Fuses had been made to unusually high standards of precision and accuracy for many, many years.

The extra hundreds of thousands of Jefferson-Union Fuses needed for ships, planes, signal corps trucks and in ordnance and essential war production plants required greater production capacity which with advanced methods and technique, now permit us to insure prompt deliveries.... When you specify Jefferson-Union Fuses for the reliable protection of vital electrical circuits and costly equipment you can be sure of getting them.

For your convenience, stocks are carried by Electrical Wholesalers. . . . JEFFERSON ELECTRIC COMPANY, Bellwood (Suburb of Chicago), Illinois. In Canada: Canadian Jefferson Electric Co. Ltd., 384 Pape Ave., Toronto, Ont.



JEFFERSON UNION Renewable FUSES

JEFFERSON ELECTRIC

It's time for FOUNDATION-BUILDING

A *Skilled Lighting* System will need No Reconversion!

Equip plants now, to speed today's and tomorrow's production

Here's a wartime plant modernization that will carry over all its efficiency-boosting benefits into peacetime operations . . . without any additional purchases, remodeling or re-tooling!

A modern high-intensity lighting system equipped with Wheeler "Skilled Lighting" Fixtures is a permanent plant improvement. It will pay dividends in higher worker-output, improved product-quality, lower accident rates and better morale, for years to come.

Wheeler Lighting is *skilled lighting* because it's designed with the know-how and vision of engineers who have specialized in good lighting for more than 60 years. It's built to highest RLM standards of construction, durability and light-output per watt.

Write for details of Wheeler's complete line of Incandescent and Fluorescent Fixtures for industries. Wheeler engineers will be glad to help you plan correct layouts. **Wheeler Reflector Company, 275 Congress Street, Boston 10, Mass.** Also New York. Representatives in principal cities.

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

Wheeler All-Steel Fluorescent Fixtures offer economical, high-intensity lighting for individual installations or continuous runs. Porcelain enameled steel reflectors with high reflection efficiency. Broad, heavy wiring channels with accessible enclosed ballasts. Made for two 40-watt, three 40-watt and two 100-watt lamps. Dust-Tight Fluorescent Units also available.

Wheeler Incandescent Fixtures are available for any industrial use. RLM Solid Neck, Standard Dome Reflector, above, is just one typical example. Made in a complete range of standard shapes . . . dome, angle, etc. Provide maximum lighting efficiency for lamps from 75 to 1500 watts.

Wheeler REFLECTOR COMPANY

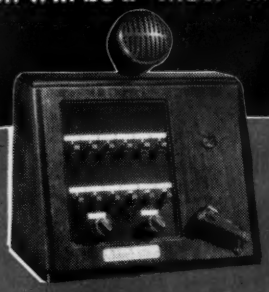
LIGHTING EQUIPMENT SPECIALISTS SINCE 1881

New support from the ground up . . via GraybaR

PROFIT IN 1945

SELL TELETALK AMPLIFIED INTERCOMMUNICATION AND PAGING SYSTEMS!

Modern Intercommunication will be a "Must" in New Day Business Planning



Tomorrow's business operations will depend on efficient time-saving as never before. Teletalk Amplified Intercommunication and Paging Systems speed office routine, save steps, reduce errors, conserve energy, put ideas to work quickly.

Electrical Contractors building a firm foundation for this quickened business tempo are counting on profits from sales of Teletalk to progressive business concerns in their vicinity. From the small two-suite office to the largest factory and warehouse, Teletalk fills a long-time need for speedy voice communication and paging.

Illustrated on this page are a few of the Teletalk models which meet the needs of both large and small concerns. Teletalk operates from the electric light circuit . . . is easy to install . . . requires little service . . . pays for itself in a few months' time.

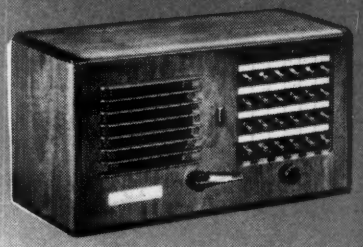
Teletalk is the leading and best known system of its kind . . . is nationally advertised . . . carries a good margin of profit . . . is distributed nationally by Graybar.

Ask the Graybar man who calls on you about Teletalk Amplified Intercommunication and Paging Systems. Let him show you how to appraise the needs of an office or plant, how to plan installations, specify materials and estimate labor involved. He knows because he has profited from the sale of Teletalk systems. He will tell you how to do it.

Ask him NOW. Don't wait another day to get set to profit from Teletalk in 1945.

Model 10112 Paging Control Unit with facilities to connect through an amplifier to 12 speaker lines. These stations may also provide facilities for 24 speaker lines. There may be one or more speakers on each line.

Model 512 is a deluxe Teletalk model for executive use. A microphone on the top makes manual operation unnecessary while talking. A handset may be attached for private conversation.



Shown above is a Teletalk Model 224 which will provide two-way conversation with 24 stations. The 200 Series is also available in 6 station and 12 station sizes.

Licensed under U. S. Patents of Western Electric Company, Incorporated, and American Telephone and Telegraph Company.

WEBSTER ELECTRIC COMPANY, Racine, Wisconsin, U.S.A. • Established 1909. Export Dept.: 13 E. 40th Street, New York (16), N. Y. Cable Address: "ARLAB", New York City

WEBSTER ELECTRIC

Teletalk

REG. U.S. PAT. OFFICE

Let's All Back the Attack —Buy *Extra* War Bonds

WEBSTER ELECTRIC

"Where Quality is a Responsibility and Fair Dealing an Obligation"

It's time for FOUNDATION-BUILDING

ADEQUATE WIRING THE KEY TO THE HOME OF TOMORROW

Make sure of

Better Light TODAY for the WORLD OF TOMORROW

WHATEVER installation you may have in mind make it a habit to see what SMITHCRAFT can offer you . . . either for commercial or for industrial application.

SMITHCRAFT FIXTURES are all designed for specific purposes and reflect the alertness and seasoned judgment of our highly capable lighting engineers. Catalogs sent gladly!

A. L. SMITH IRON CO. Chelsea 50, Mass.

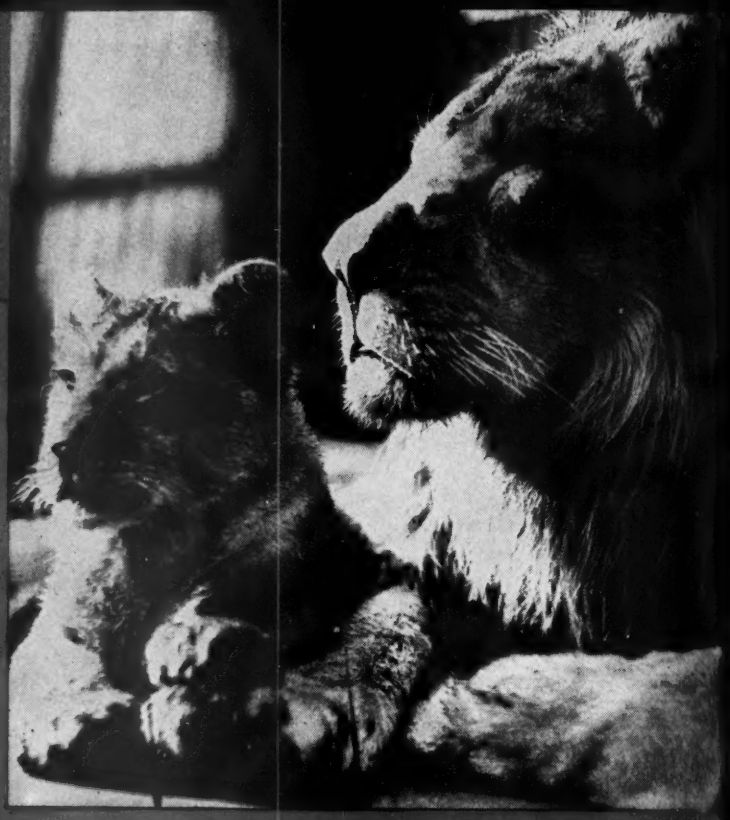
with SMITHCRAFT

SMART FLUORESCENT FIXTURES

"Foremost in design and efficiency"

New support from the ground up . . via GraybaR

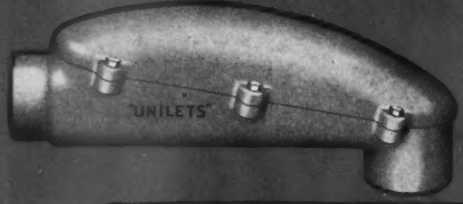
FROM MIDGETS TO MOGULS



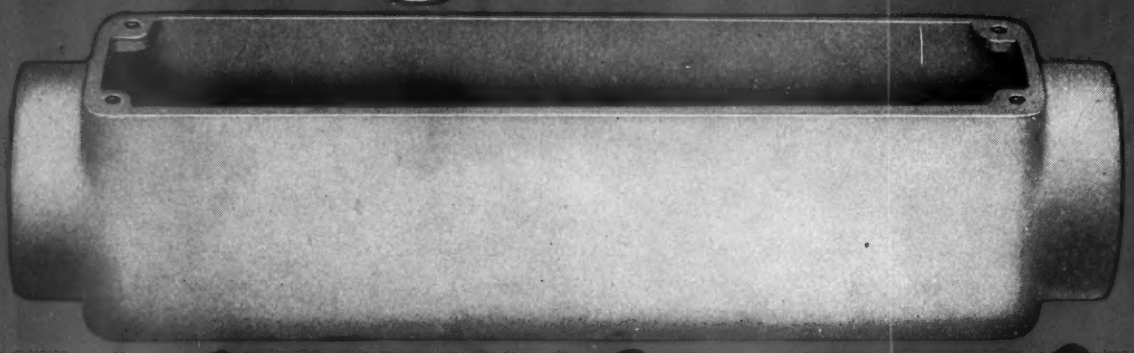
Type C No-Thread Rectangular "Unilet" Sizes ⅜" to 4".

Type LR Form 35 No-Thread "Unilet". Sizes ½" to 4".

Type E Form 35 No-Thread "Unilet". Sizes ½" to 4"



Type LBD Form 35 Threaded "Unilet". Sizes 2½" to 6".



Type BC Threaded Mogul "Unilet" Sizes 1" to 4".

Complete Appleton Line

ANSWERS EVERY FITTING REQUIREMENT

Appleton "Unilets" help you do better wiring jobs faster. They offer precisely the right size and type for every fitting need—from the smallest sizes to the big moguls. They will not break, even under extreme temperature variation, because they are built from light, strong MALLEABLE IRON; made to exacting specifications in Appleton's own foundries.

Wiring spaces are ample in all "Unilets"; surfaces are smooth, and free from holes, blemishes and gating marks.

"Unilets" of practically all types are made for use either with rigid or thin-wall conduit; and all threaded types in ½" to 2" sizes can be used with thin-wall conduit by means of Appleton Quick Adapters.

The complete Appleton line—15,000 distinct sizes and types of fittings and fixtures—is the result of 41 years of leadership in skilled engineering, practical design and careful workmanship. Appleton service is as dependable as the line is complete.

Jobs run smoother and better work results when Appleton fittings and fixtures are used. Time and energy are saved. Specify the best to do your best . . . Appleton—"Standard for Better Wiring."

Sold Through Wholesalers

APPLETON ELECTRIC COMPANY

1704 WELLINGTON AVENUE • CHICAGO 13, ILLINOIS

Branch Offices: NEW YORK, 76 Ninth Avenue • DETROIT, 7310 Woodward Avenue • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Minna Street • ST LOUIS, 420 Frisco Bldg. • LOS ANGELES, 100 North Santa Fe Avenue • ATLANTA, 175 Luckie Street, N. W. • BIRMINGHAM, 6 N. Twenty-first Street • MINNEAPOLIS, 305 Fifth Street, S. • PITTSBURGH, 418 Bessemer Bldg.

Resident Representatives: Baltimore, Boston, Cincinnati, Dallas, Denver, Kansas City, Milwaukee, New Haven, New Orleans, Philadelphia, Seattle.

APPLETON ELECTRIC PRODUCTS REG. U.S. PAT. OFF.

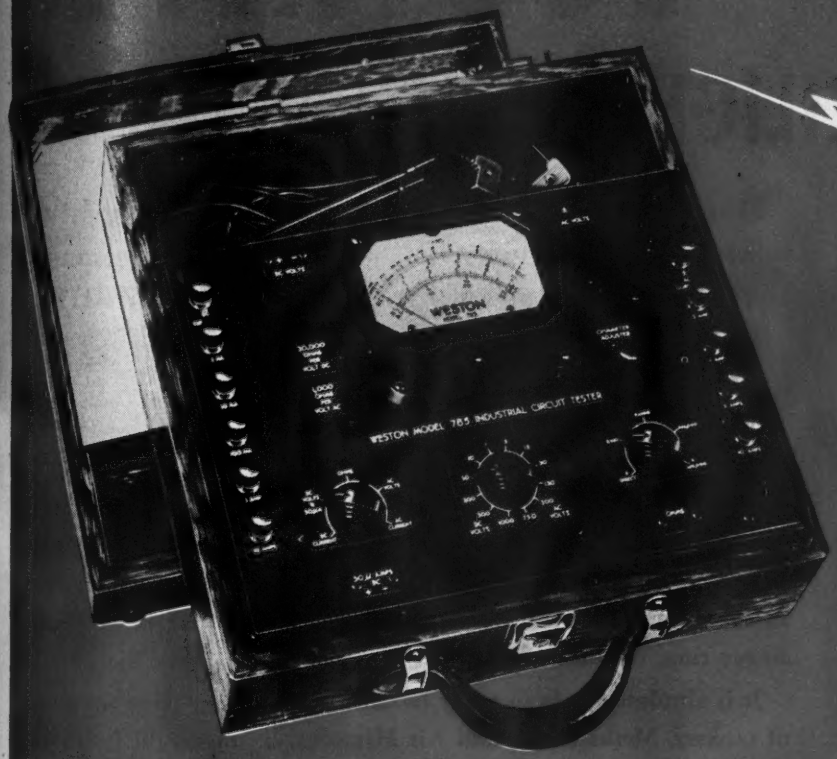
APPLETON

CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • KNEELITES

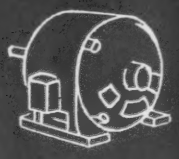
It's time for FOUNDATION-BUILDING

ADEQUATE WIRING THE KEY TO THE HOME OF TOMORROW

MEASURES THE *new* MAINTENANCE VALUES



as well as the old . . .



Weston MODEL 785 Industrial Circuit Tester

RANGES

D-C Voltage—*Measurements from 10 millivolts to 1000 volts (20,000 ohms per volt) in full scale ranges of: 1/10/50/200/500/1000 volts. (Up to 5000 volts with very compact external multiplier.)*

A-C Voltage—*Measurements from 0.1 to 750 volts (1000 ohms per volt) in full scale ranges of: 5/15/30/150/300/750 volts.*

D-C Current—*Measurements from 0.5 microampere to 10 amperes, in full scale ranges of: 50 microamperes, 1/10/100 milliamperes, 1/10 amperes. (Higher ranges with external shunts.)*

A-C Current—*Measurements from 10 milliamperes to 10 amperes, in full scale ranges of: .5/1/5/10 amperes. Higher ranges, up to 1000 amperes, with external current transformers.*

Resistance—*Measurements from 0.5 ohm to 30 megohms in full scale ranges of: 3,000/30,000/300,000/3 meg./30 meg. Center scale values are: 25/250/2,500/25,000/250,000 ohms.*

• The growing use of electronic devices and other sensitive circuits throughout industry poses no new instrument problems for contractors or maintenance departments WESTON equipped. The familiar Model 785, with its high sensitivity and broad range scope, answers these *newer* measurement requirements. But more . . . it also covers most of the *usual* maintenance needs.

Model 785 furnishes another example of WESTON'S engineering foresight . . . designing instruments always with the needs of *to-morrow* in mind. Other WESTONS, equally important for efficient maintenance in the days to come, are the time-saving WESTON Clamp Ammeter, and the WESTON foot candle meters which measure all types of lighting direct . . . *without correction factors.* Weston Electrical Instrument Corporation, 578 Frelinghuysen Avenue, Newark 5, New Jersey.

Laboratory Standards . . . Precision DC and AC Portables . . . Instrument Transfomers . . . Sensitive Relays . . . DC, AC, and Thermo Switchboard and Panel Instruments.

WESTON

Specialized Test Equipment . . . Light Measurement and Control Devices . . . Exposure Meters...Aircraft Instruments... Electric Tachometers...Dial Thermometers.

FOR OVER 55 YEARS LEADERS IN ELECTRICAL MEASURING INSTRUMENTS

New support from the ground up . . via GraybaR

Play it safe JUSTRITE

SAFETY FLASHLIGHTS and LANTERNS

Justrite Safety Products are made for safety and rugged service. Ask your Graybar salesman about them. Play safe with safety . . . JUSTRITE.

NO. 17-S THE NEW JUSTRITE SERVICE FLASHLIGHT

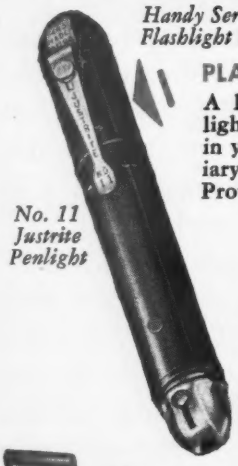
The new, handy, lightweight plastic electric light with the famous Justrite safety and service features. Uses 3 standard size D dry cells to give 1500 candlepower beam which can be focused. Signal flasher in easily replaced switch. Can be carried upright by belt clip, by finger ring, or stood on flat surface.

It is absolutely safe in many hazardous locations . . . pump rooms of tankers, Methane Gas and Air Mixtures, in mines, oil fields, and chemical plants. Approved for Safety by Underwriters' Laboratories, Inc., by the U. S. Bureau of Mines, and by the Bureau of Marine Inspection and Navigation.

Handy Service Flashlight No. 17-S

PLASTIC PENLIGHT

A lightweight, handy, plastic penlight with clip attached for carrying in your pocket. Popular as an auxiliary light because of its portability. Provides either white or red beam.



No. 11 Justrite Penlight

No. 32-S Justrite Safety Headlight Lantern

NO. 44-S TWIN-BULB ELECTRIC SAFETY LANTERN

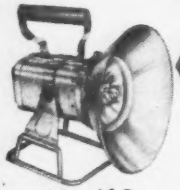
This sturdy, dependable, all-purpose safety lantern is absolutely safe in many hazardous locations.

It's safe against the hazards of bulb failure . . . with its "kick-out" bulb sockets and a relief bulb that is moved into lighted position by simply throwing the switch. Meets the same rigid safety tests as listed above for the Justrite Handy Service Flashlight.

All-Purpose Safety Lantern No. 44-S

JUSTRITE SAFETY HEADLIGHT LANTERN

Super-power headlight, adjustable, moisture-proof headband. Battery case carried in pocket or clipped to belt. Uses 4 standard flashlight cells.



No. 46-S Inspector's Safety Lantern

INSPECTOR'S TYPE SAFETY LANTERN

Powerful beam . . . polished 7-inch reflector . . . extra large handle for ease in carrying and handling. Movable base permits adjusting to any angle. Uses standard 6-volt battery. Sturdy construction. Approved for safety by U. S. Bureau of Mines.

There is a JUSTRITE SAFETY LANTERN FOR EVERY USE

Wherever a Safety Light is required, Justrite is the "Favorite" on ships, railroads, in mines, chemical plants, factories and oil fields. These lanterns are available today only on priorities...but tomorrow they will be available for all users. Plan your stock NOW...Play it safe with JUSTRITE.

JUSTRITE MANUFACTURING COMPANY

2063 N. Southport Ave., Dept. M-6, Chicago 14, Ill.

It's time for FOUNDATION-BUILDING

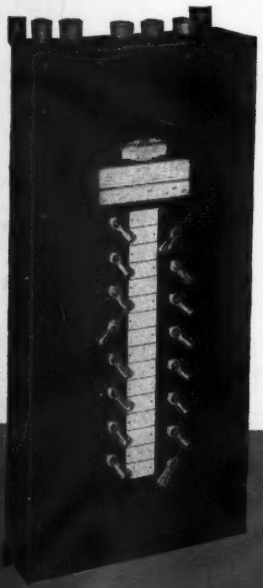
Above: (FA) Dust-tight Power Panelboard with 225 and 600 Amp Frame Circuit Breakers.

Where DUST is a HAZARD

exposed arcs may set off disastrous explosions. Guard against this danger by installing

(FA) DUST-TIGHT Light and Power PANELBOARDS

Below: (FA) Dust-tight Lighting Panelboard and Cabinet for wall or exposed column mounting.



They are approved by Underwriters' Laboratories, Inc., for "Class II, Groups F and G, Hazardous Locations." This includes coal mines, coal processing plants, shell-loading plants, grain mills, and other places where dust is a dangerous factor.

These panelboards have a solid steel front plate, gasketed all around, and secured with screws to an extra wide box flange. They are further rendered dust-tight with welded hubs for conduit outlets, welded box corners, and handle bushings riveted directly to the steel cover plate. External mounting brackets are provided, to maintain the dust-tight construction.

The circuits are externally operated by a mechanism of new (FA) design. The handles operate through dust-tight bushings, and engage the regular handles of the circuit breakers inside the cabinet. ON and OFF positions are indicated on the front of the cabinet.

(FA) Dust-tight Panelboards are of the circuit breaker type. Capacities of Power Panels: 15 to 600 amperes, 250 volts AC or DC, and 600 volts AC. Lighting Panels, standard or narrow column type, equipped with (FA) Type AC Thermag or (FA) Dublbrak Circuit Breakers (or other types of ranch-circuit circuit breakers). Available with 4 to 42 circuits, 50 amperes or less, for 3 wire, single phase, or 4 wire, 3 phase mains, with lugs only, or main breaker.

Write for Bulletin 67

which contains descriptions, sizes, capacities, wiring diagrams, prices and suggested specifications . . . Frank Adam Electric Company, Box 357, St. Louis 3, Mo.

The same form of construction but with rubber (or equivalent) type of gasket is available for VAPOR PROOF installation.

Frank Adam
ELECTRIC COMPANY
ST. LOUIS

New support from the ground up . . via GraybaR

Let FARADAY signals help you meet tomorrow's demands

Faraday UNI-PACT Signals are high on the list of "new time-saving tools" which industry needs immediately. They represent the peak of achievement in signal engineering. Every UNI-PACT Signal comes complete with the exclusive UNI-PACT Safety Adapter Plate, which fits 14 different types of UNI-PACT Signals. Result: Signals can be changed in any department at any time without changing wiring or even shutting off current—easy as plugging in a toaster.

IMPORTANT SAFETY FEATURE

Contact prongs are *on the signal,* not on the adapter plate. The adapter plate is "dead" front—not "live." Consequently there is no risk of shock for the one who changes the signals. This is an exclusive Faraday development, in line with modern safety practice. Your rough-in men on new construction can install the UNI-PACT Adapter Plate and signals can be plugged in at any later time.

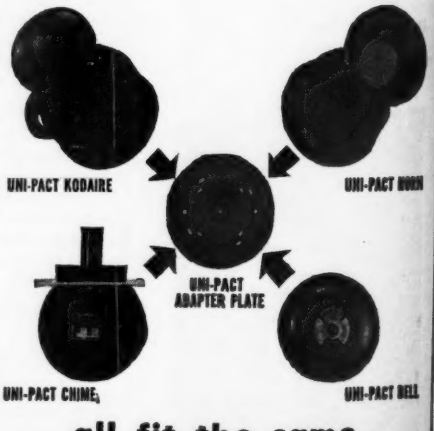
The complete Faraday line includes a full range of standard signals in addition to the UNI-PACT line.

FARADAY SIGNALS ARE DISTRIBUTED THROUGH ELECTRICAL WHOLESALERS

WRITE TODAY FOR COMPLETE NEW CATALOG EC-61

FARADAY

UNI-PACT KODAIRES
HORNS, BELLS, CHIMES



all fit the same UNI-PACT Safety Plate

FARADAY ELECTRIC CORPORATION

A consolidation of Schwarze Electric Co. and Stanley & Patterson

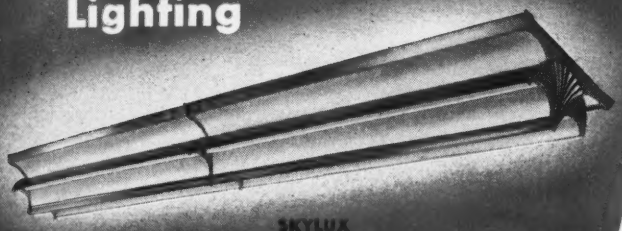
ADRIAN, MICHIGAN

It's time for FOUNDATION-BUILDING

Curtis

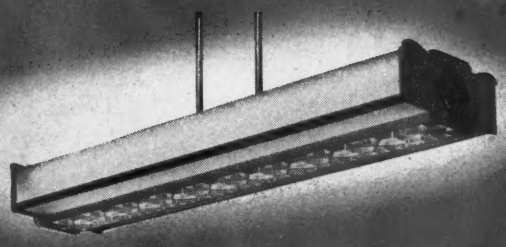
COVERS BOTH FIELDS

COMMERCIAL Lighting



SKYLUX

An attractive, exceptionally efficient luminaire for two 40-watt fluorescent lamps. Ceiling or pendant mounted. Quickly adaptable for continuous runs.



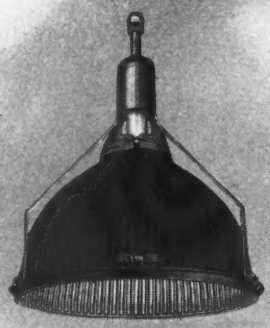
STARLUX

Designed for four 40-watt fluorescent lamps. Of outstanding beauty and low brightness. Easy to maintain.

INDUSTRIAL Lighting

FLUORESCENT INDUSTRIAL UNITS

For two or three 40-watt lamps. Fluracite on steel reflecting surface assures highest efficiency and permanence.



"X-RAY" SILVER MIRROR REFLECTORS

For incandescent and mercury lamps up to 1500 watts. By far the most efficient unit for industrial and high-bay installations. Other sizes available.

A LIGHTING EQUIPMENT LINE WITH A REPUTATION UPON WHICH YOU CAN BUILD

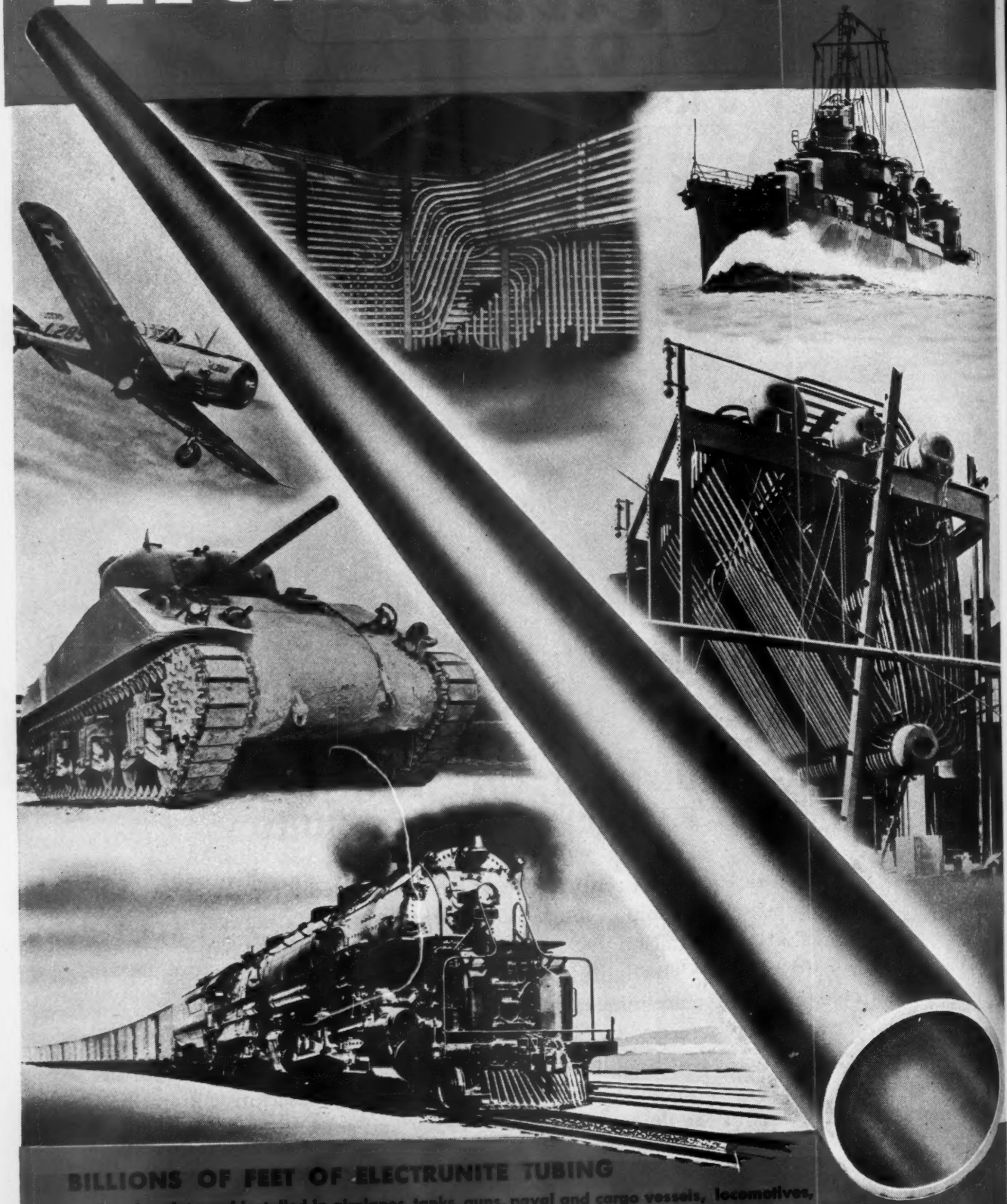
For almost half a century Curtis has maintained a reputation for leadership in commercial and industrial lighting . . . and that's a reputation you can bank on for the present and build on for the future! The lighting units illustrated above are typical for today's times. They are inherently superior in design, material and fabrication. Each is characterized by high efficiency and attractive appearance. The modern engineering features built into these fixtures are very readily apparent in the low cost and effort of installation and maintenance. Fully descriptive literature is available on any or all of the units shown. Write today and start to build for the future.

CURTIS Lighting, INC.

6135 WEST 65TH STREET, CHICAGO 38, ILLINOIS

New support from the ground up . . via GraybaR

ELECTRUNITE —a word



BILLIONS OF FEET OF ELECTRUNITE TUBING

produced to date and installed in airplanes, tanks, guns, naval and cargo vessels, locomotives, power plants, refineries, synthetic rubber plants, chemical plants, machinery, appliances and electrical generating and distributing systems—to mention only a few—have demonstrated conclusively the soundness, safety and economy of this high quality tubular product.

It's time for **FOUNDATION-BUILDING**

ADEQUATE WIRING THE KEY TO THE HOME OF TOMORROW

that means "electrically united"
—CAN MEAN A LOT TO YOU!

• When you see the name ELECTRUNITE on tubing, remember this: It means **ELECTR**ically **UNITE**d, and was derived from these two words as shown by the capital letters.

All ELECTRUNITE Tubing—whether aircraft, pressure, mechanical, structural or electrical metallic—is made by essentially the same basic process of cold forming flat rolled steel to tubular shape and welding it electrically—the original process pioneered and continuously improved by Steel and Tubes Division.

Through this process and the steel from which it is made, all ELECTRUNITE Tubing acquires uniformity, strength, toughness and easy workability in whatever degree is demanded by the application.

When produced as electrical metallic tubing, ELECTRUNITE brings all of these advantages to electrical contractors and industrial maintenance men:

Light in weight . . . Strong and tough . . . Easy to bend, cut, join and wire . . . No threads . . . Uniform corrosion-resistance . . . Choice of fittings . . . Full approval.

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • CLEVELAND 8, OHIO
Berger Manufacturing Division
Culvert Division • Niles Steel Products Division
Union Drawn Steel Division • Truscon Steel Company
Export Department: Chrysler Building, New York 17, New York

WIDESPREAD DISTRIBUTION

ELECTRUNITE STEELTUBES E.M.T. is sold *exclusively* through electrical wholesalers. See your nearest ELECTRUNITE Distributor—because he is your best bet for complete detailed information—and for a full line of dependable electrical supplies. If you don't know his name, write us.

REPUBLIC STEEL
PRODUCTION FOR VICTORY

Republic "INCH-MARKED"
ELECTRUNITE
Reg. U. S. Pat. Off.
Steeltubes

ELECTRICAL METALLIC TUBING MARKED WITH A CONTINUOUS FOOT-RULE

New support from the ground up . . via GraybaR

ECONOMY FUSE AND MANUFACTURING CO.

GREENVIEW AVENUE AT DIVERSEY PARKWAY CHICAGO 14, ILLINOIS

Since 1911-Quality Products and Dependable Service

ECONOMY RENEWABLE FUSES

The Pioneer Fuse made famous by the

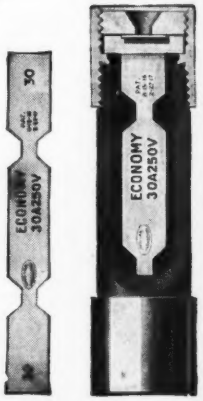
"DROPOUT" RENEWAL LINK

THE Original Clearsite Plug Fuse shows how it blows

BLACK—insulation all black all the way thru—NOT PAINTED PORCELAIN. When a Clearsite Fuse has not blown, the fuse element with the amperage stamped upon it is plainly visible thru the clear mica window.

When a Clearsite Fuse has blown on overload, a gap appears in the fuse link under the window.

When a Clearsite Fuse has blown on short circuit, the window is blackened, making vision of the fuse link impossible.



ECONOMY
Renewable Cartridge Fuses and "dropout" Renewal Link

REASONS for its Superiority

1. **Easily inspected—capacity plainly visible**
2. **Small, strong, clear window**
3. **Link melts immediately under window**
4. **Economy "DROPOUT" Link an exclusive feature**
5. **Insulation cap has fluted grip**
6. **Tough molded insulation body—not fragile like glass or porcelain**
7. **Screw shell securely attached**
8. **Condition of fuse always evident**
9. **Shows which fuse has blown and WHY**
10. **Handy retail package fits in fuse cabinet**

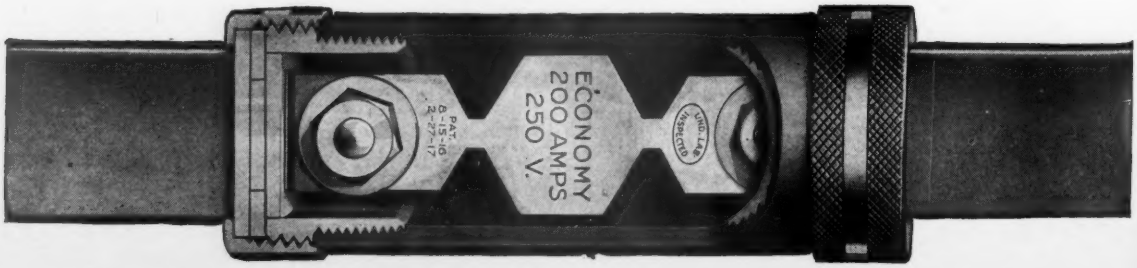
ARKLESS
Non-Renewable Mechanical Indicating Cartridge Fuses

- **We can fuse electrical circuits everywhere**
- **Made in all capacities to 30 amperes for 125 volts**

CLEARSITE
Plug Fuses—shows when blown

ECONOMY FUSES SINCE 1911

ECO
Non-Renewable — Non-Indicating Cartridge Fuses



It's time for FOUNDATION-RUBBING

Ready Now GET YOUR COPY OF THE NEW MITCHELL CATALOG NO. 281

Complete Data and Information Ready to Help You Do a Better, Easier Industrial Lighting Job!

MITCHELL FLUORESCENT

Get Catalog No. 281 from your MITCHELL DISTRIBUTOR *or write us today!*

MITCHELL *Manufacturing Co.*

2525 CLYBOURN AVE. • CHICAGO 14, ILLINOIS

West Coast Factory and Sales Office: 1019 N. Madison Ave., Los Angeles 27, Cal.

New support from the ground up . . . via GraybaR

you're always

"ON THE SAFE SIDE"

WITH TRUMBULL *TYPE* A HEAVY DUTY INDUSTRIAL SWITCHES

THE PIONEER LINE

The Trumbull Heavy Duty, Motor Circuit, Type "A", Safety Switch is of unsurpassed efficiency, mechanically and electrically—capable of withstanding the stresses of operation under heavy load conditions day after day. It is an insurance policy against accidents and shut-downs. It is also available from stock.

A Word to the Wise Contractor

Practically every industrial and commercial establishment in your territory has requirements for this basic type of safety motor circuit switch either for replacement, or for new installation to improve electrical efficiency and safety. This is important to you because the supply situation on Trumbull Type "A" Switches is favorable to both present and future business development for the contractor. Keep your eyes open for opportunities to recommend Trumbull Type "A".

FEATURES, IMPORTANT TO EVERY USER!

Switch contacts and parts are accessible from the front, permitting examination under load. Jaw and hinge posts are of machined, built-up type of construction—not bent from copper strip. Contacts are hand tested with a precision feeler gauge, guaranteeing proper alignment and adjustment.

Insulating fibre cross-bar prevents arcing over from accumulation of dust and safeguards against grounding in case of excessive overload.

Solderless Lugs—Safety Cover Catch—Locking "On" and "Off"—Swinging Arc Quenchers—Releasable Interlocking Cover—Quick-Make and Quick-Break—Horsepower Ratings. 30 to 2400 Amp., 2, 3 and 4 pole, 230—575 V. A.C., 250 to 600 V. D.C. Fusible, No Fuse, Single Throw. 30 to 600 Amp. Double Throw.

ELECTRICAL CONTROL APPARATUS

Safety Switches and Circuit Breakers . . Service Equipment . . Motor Control . . Control Centers . . Panelboards . . Switchboards . . Feeder Distribution Systems, etc.

THE TRUMBULL ELECTRIC MANUFACTURING COMPANY • PLAINVILLE, CONN. • A GENERAL ELECTRIC ORGANIZATION

OTHER FACTORIES AT NORWOOD (CINN.) O. — SEATTLE — SAN FRANCISCO — LOS ANGELES

It's time for FOUNDATION-BUILDING

EASY TO WIRE and INSTALL

EASY TO MAINTAIN !

DEPENDABLE SERVICE

3 Big Reasons

WHY CONTRACTORS PREFER THE "REVERE" LINE

THERE'S A Revere UNIT

for EVERY LIGHTING JOB

AIRPORT

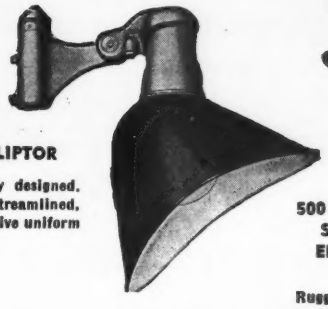
MARINE

INDUSTRIAL

SPORTS!

4200 SERIES ENCLOSED TYPE FLOODLIGHT

A masterpiece in design and construction. Rotates in yoke for easy, safe maintenance.



THE ELIPTOR

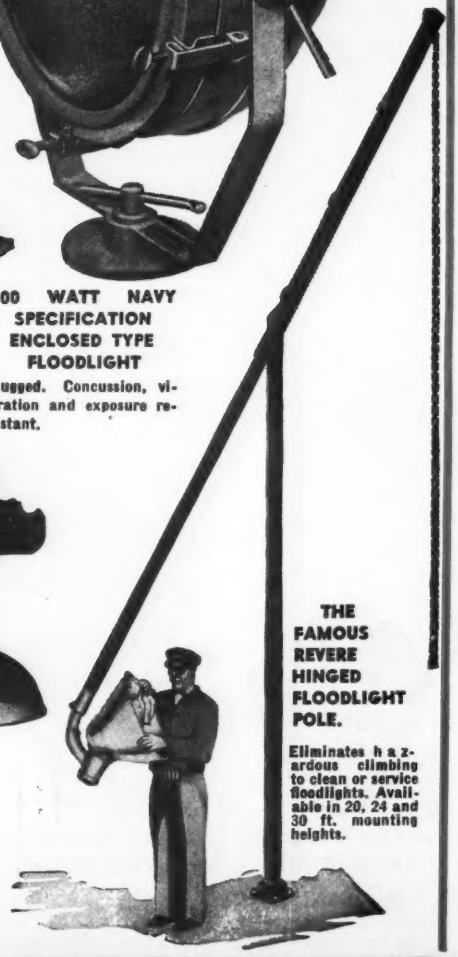
Ingeniously designed. Neat, streamlined, gives effective uniform lighting.

500 WATT NAVY SPECIFICATION ENCLOSED TYPE FLOODLIGHT

Rugged. Concussion, vibration and exposure resistant.

Incandescent Searchlight for Pilot House Control or Hand Control. 12", 18", and 24" lens sizes.

This Revere Unit serves many purposes because it can be converted to make a combination area light and spot light with one or two top floods. All wiring is enclosed. Weather-proof. Area light available for 300-500 Watt or 750-1000 Watt Bi-Post lamps. Top floods 150-200 Watt or 300-500 Watt.



THE FAMOUS REVERE HINGED FLOODLIGHT POLE.

Eliminates hazardous climbing to clean or service floodlights. Available in 20, 24 and 30 ft. mounting heights.

Our many contributions toward better lighting, backed by highest quality construction, are the culmination of years of experience in the Industry.

REVERE features aid the contractor in solving lighting problems and at the same time help him build a good solid business through dependable performance and customer satisfaction.

Request REVERE equipment for that next job. Engineering data and catalog information on request.

REVERE ELECTRIC MFG. CO.

2925 NORTH PAULINA STREET · CHICAGO 13

Originators of the Hinged Floodlight Pole

INDOOR and OUTDOOR LIGHTING EQUIPMENT of EVERY DESCRIPTION

New support from the ground up.. via GraybaR

MINERALLAC PRODUCTS

Economical practical units that save Time and Labor . . .

MINERALLAC

★ Electrical Contractors should standardize on MINERALLAC PRODUCTS because of the great help they are in saving time, labor, and material. Every installation can be a profitable one if the fixtures are right—if they assure complete satisfaction to users—if they are made to proper specifications—if the right unit is available for a job, whether it is an ordinary one or an unusual and complicated one—MINERALLAC PRODUCTS are helping many busy contractors to handle additional necessary installations because of these dependable features—helping them to build a good solid business now and for the future. Your jobber stocks MINERALLAC PRODUCTS—ask him for complete facts or write us.

MINERALLAC ELECTRIC CO.

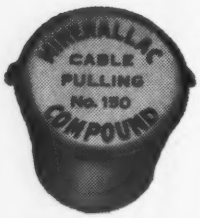
25 N. PEORIA STREET CHICAGO, ILLINOIS

CABLE AND CONDUIT HANGER

(Cadmium plated steel or EVERDUR) Made of best grade spring steel—intended especially for open wiring and for Cable and Conduit running in exposed positions where appearance is important. Split porcelain bushing available for rubber covered cable installations. Listed by Underwriters' Laboratories, Inc.

MESSENGER HANGER AND STRAP

(Cadmium plated steel or EVERDUR) These "Messenger Hangers" are designed for use on messenger cable installations in conjunction with the MINERALLAC "Messenger Strap" for outlet boxes as shown in the illustration.

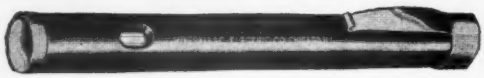


CABLE PULLING COMPOUND

A chemically inert compound for pulling in cables. Reduces pulling tension and damage to lead sheaths.

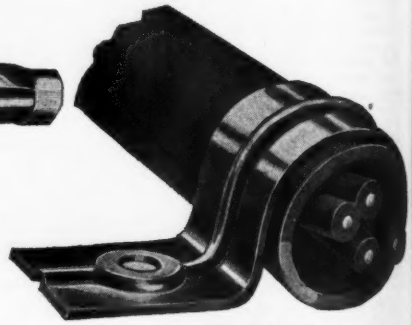
CABLE INSULATING COMPOUND

A dependable line of insulating compounds for use in Cable Joints, Potheads, and Terminal Bells. Eight types for various voltages, temperatures, and climatic conditions. Also Oil Insoluble Compound.



STATISCOPE

Used extensively for the protection of electrical workers. Pocket Type (shown) is intended for all-around testing and specially adapted for use on underground cable work. Indicates on 2000 volts and up. Also Overhead and Station Types. These glow-tube forms of electroscopes, encased in hard rubber, instantly indicate the presence of potential when held in the changing static field such as is found surrounding alternating current circuits, pulsating direct current, X-ray discharges, automobile ignition, etc.



JIFFY CLIP

(Cadmium plated steel or EVERDUR) An inexpensive, one-hole clamp for pipe, conduit, or lead-covered cable. Only one screw or bolt necessary. Light but strong. Used extensively in Defense Plants and Ship Construction, Airports, and Factories.

it's time for FOUNDATION-BUILDING

ADEQUATE WIRING THE KEY TO THE DOOR OF TOMORROW

★ Designed
★ ENGINEERED
★ MANUFACTURED

Leader

Accepted by the trade and specified by leading architects as paramount in the field of fluorescent light fixtures; Leader Units have been installed in ever increasing quantities throughout America's industrial and commercial organization. The Leader Electric Mfg. Corp. is known nationally for high standards of quality and workmanship. More important Leader straight-line merchandising methods assure jobber and dealer profits, in this, the fastest growing division of the electrical industry.

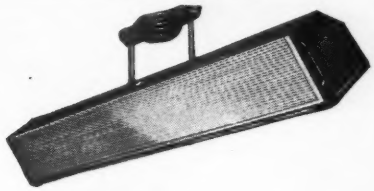
Your inquiry will receive the prompt attention of Leader Engineers.

ZUO Series:

Sturdy, streamlined industrial units available in two and three light 40 watt units and two light 100 watt units. Rigid all-steel construction. Designed for individual or continuous run installation.

ZIU

Industrial units for concentrated and complex lighting installations, available in two and three light 40 watt units and two light 100 watt units. Designed for individual or continuous run mounting.

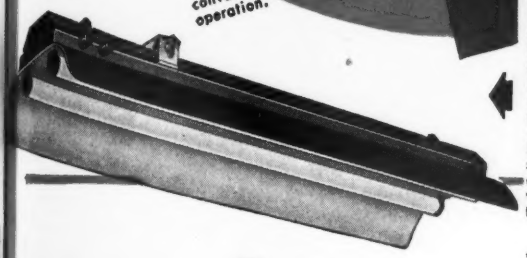


GL-240:

Two light 40 watt, glass enclosed, louvred unit, unusually efficient, designed for pendant or ceiling suspension mounting, constructed for individual or continuous run installation.

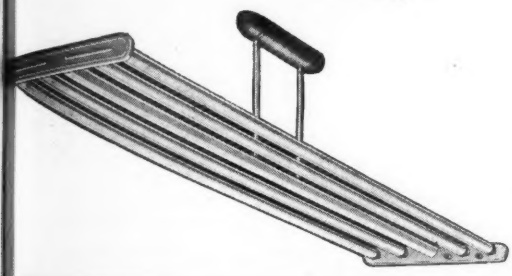
RECESSED TROFFER UNIT

Versatile installations, by the unit or by the mile, combined with quality workmanship and low maintenance costs make the new Leader Recessed Troffer Unit outstanding in this field. Furnished in 12" width one or two light or 24" widths two or four light sections. Available with or without louvers and glass shielding. Constructed for conventional or instant start operation.



IUO-240:

The STRATOLINER—Efficient heavy duty industrial lighting unit well known to lighting engineers and architects. Reflectors have captive knurled clasps, preventing loss in servicing. Channels designed with grooves to take adjustable hanging clamps for flexible installations and light direction. Can be installed singly or in continuous run. Also available in three 40 and two 100 watt units. Constructed for conventional or instant start operation.

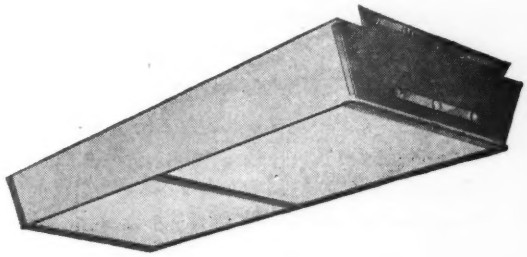


VO-440:

Four light 40 watt, parallel tube, open type luminaire. Remarkably simple to install, maintain, and service. Available for pendant or ceiling suspension mounting, continuous run or individual installation.

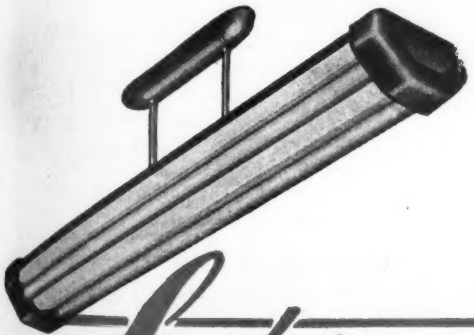
LR-440:

Four light 40 watt, glass enclosed unit, manufactured in accordance with the Utilities Research Commission specifications. Available for pendant or ceiling suspension mounting, individual or continuous run mounting.



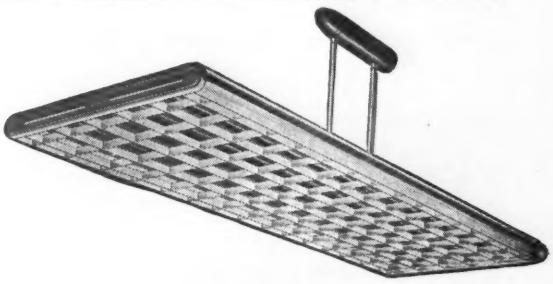
L-440:

Four light 40 watt, parabolic, open type unit, specifically suited for drafting rooms and war production offices where general overall light is required. Available for pendant or ceiling suspension mounting, continuous run or individual installation.



VL-440:

The LEADER OFFICER — Four light 40 watt plastic enclosed, louvred unit, combining the finest in design, construction, and servicing feature, this unit offers the ultimate in lighting equipment. Available for pendant or ceiling suspension mounting, individual or continuous run installation.

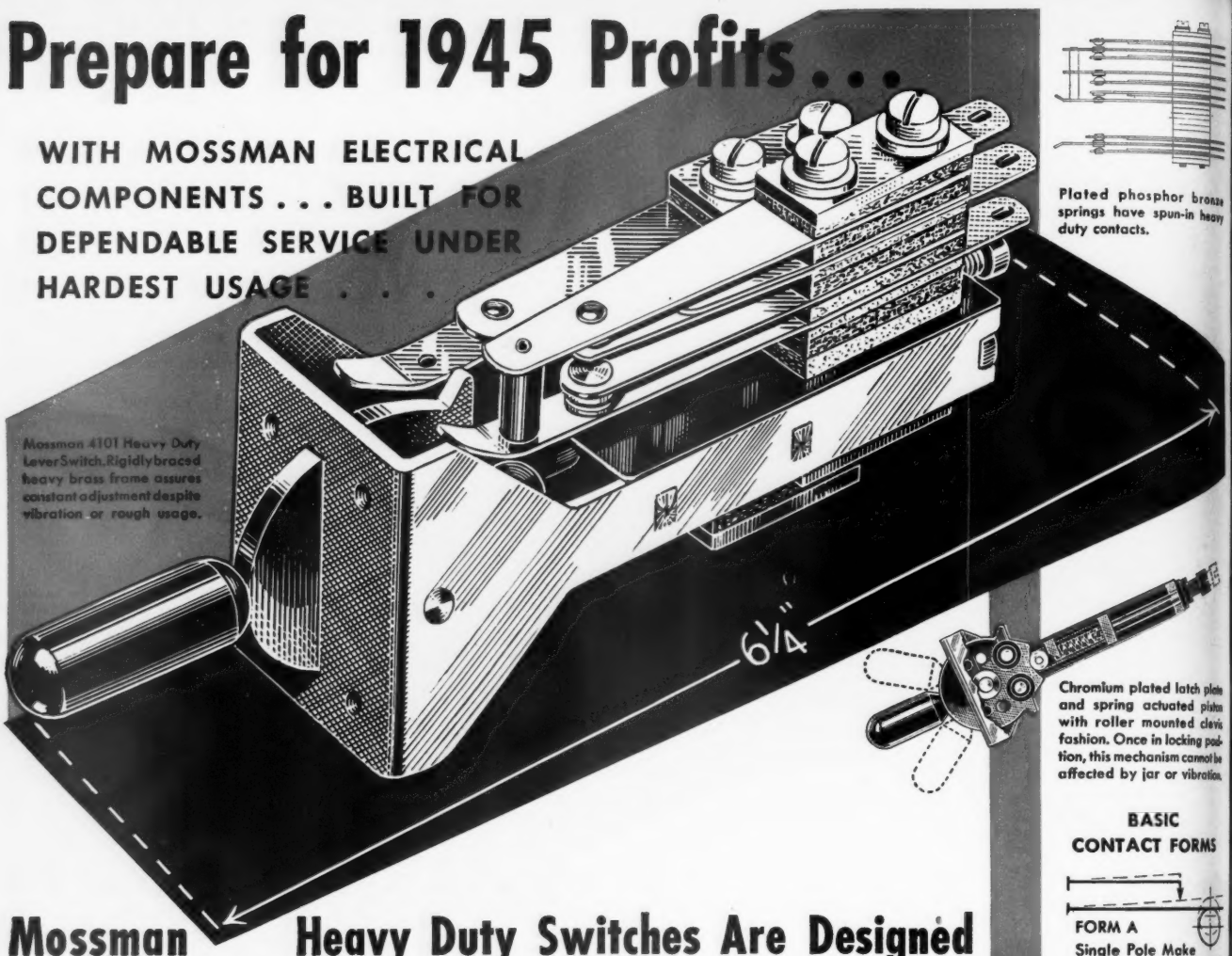


Leader ELECTRIC MFG. CORP. · 6127 BROADWAY CHICAGO 40, ILLINOIS

New support from the ground up.. via GraybaR

Prepare for 1945 Profits . . .

WITH MOSSMAN ELECTRICAL COMPONENTS . . . BUILT FOR DEPENDABLE SERVICE UNDER HARDEST USAGE . . .



Mossman 4101 Heavy Duty Lever Switch. Rigidly braced heavy brass frame assures constant adjustment despite vibration or rough usage.

Plated phosphor bronze springs have spun-in heavy duty contacts.

Chromium plated latch plate and spring actuated piston with roller mounted clevis fashion. Once in locking position, this mechanism cannot be affected by jar or vibration.

Mossman Heavy Duty Switches Are Designed to Meet Most Exacting Specifications . . . . .

Because of their superior design, excellent quality and performance, Mossman Heavy Duty Switches meet some of the most exacting specifications ever stipulated for this type of product.

Electrical Contractors will find many profitable sales for Mossman Electrical Components where absolute dependability, positive locking action, freedom from effects of jar and vibration and a wide range of contact arrangements are important considerations.

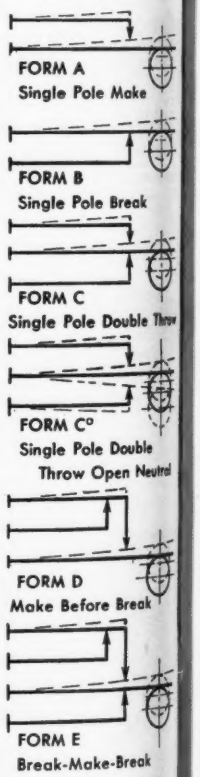
Pictured here is the Mossman 4101 Heavy Duty Lever Switch, a big, husky switch for the tough job. Its powerful detent mechanism is impossible to jar out of position once the switch is locked.

Up to 48 springs may be built into this switch with 12 springs per pile-up, 24 springs per position. Any combination of the six basic forms illustrated are available in order that the switch may most exactly meet the requirements at hand.

Ask your Graybar man about the Mossman 4101 Heavy Duty Lever Switch and about the many other precision electrical components in the Mossman line. They include many types of heavy duty multiple circuit lever switches, turn switches, push switches, plug jacks and other special switching components. A complete catalog will be sent on request.

DONALD P. MOSSMAN, Inc.
612 North Michigan Avenue Chicago 11, Illinois

BASIC CONTACT FORMS



FORM A
Single Pole Make

FORM B
Single Pole Break

FORM C
Single Pole Double Throw

FORM C°
Single Pole Double Throw Open Neutral

FORM D
Make Before Break

FORM E
Break-Make-Break

ASK THE GRAYBAR MAN
About These Mossman Heavy Duty Switches

SERIES 6300 HEAVY DUTY TURN SWITCHES

Meet the most exacting requirements for heavy duty, multiple circuit turn switches. Are available as both three position and two position switches.

SERIES 4200 HEAVY DUTY LEVER SWITCHES

Combine many of the outstanding features of the Series 4100 Switches with lighter weight and more compact size. Frame is of zinc or aluminum die casting. Also available as three position or two position switches.

MOSSMAN
Electrical Components

It's time for FOUNDATION-BUILDING

ENGINEERS SPECIFY "SHERARDUCT" RIGID STEEL CONDUIT

- Sherasolution which impregnates zinc
- Surface zinc over the alloy may be as thick as desired
- Alloy composed of surface steel and zinc making a new metal, zinc-steel alloy
- "Premium" steel costing more per ton than ordinary merchant pipe

Sherarduct

* Threads as well as interior have equal protection with the outer wall of the conduit.

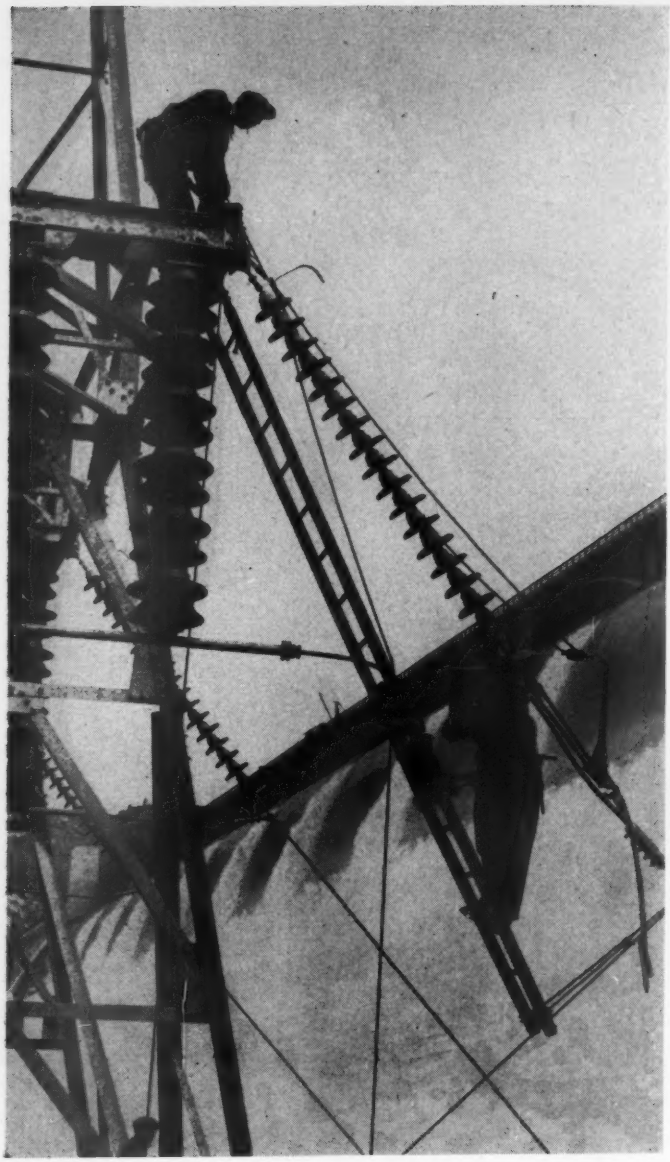
National Electric

Products Corporation

Pittsburgh, Pa.

NATIONAL ELECTRIC PRODUCTS — WIRING & WIRING WIRES AND CABLES

New support from the ground up.. via GraybaR



Pictured above is lineman Ned Ingalls who, with the aid of a Coffing "Safety-Pull" hoist, is man-handling a soon-to-be "hot" wire, as he imitates the "man on the flying trapeze" from his dizzy perch at Grand Coulee Dam.

COFFING HOISTS

We do not claim that Coffing Hoists are the final and perfect achievement, but for 16 years our hoists have been doing their jobs well.

We do claim that Coffing Hoists are the best we know how to build and experience shows them to be generally efficient. (The Army and Navy wouldn't be using them if they weren't.)

We hope that Coffing Hoists are helping to hasten the day of peace—the day our boys can come home again—the day you can call your supplier and say: "Send me a Coffing Hoist"; and your supplier can reply: "Coming right up, brother, we've got 'em in stock."

UTILITY MAINTENANCE TOOLS

"SAFETY PULL" RATCHET LEVER HOISTS

SPUR GEARED HOISTS

ELECTRIC HOISTS

TROLLEYS

COFFING HOIST COMPANY

DANVILLE ILLINOIS

It's time for FOUNDATION-BUILDING

Save Money on Every Job — With Greenlee!

HYDRAULIC PIPE BENDER FEATURES

POWER—Maximum piston pressure of 40 tons for precision bends in conduit and pipe from 1¼ to 4½ inch.

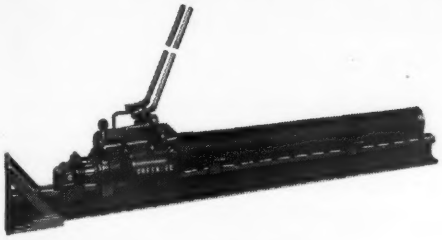
EASE—One man pumping handles makes fast, accurate bends. No kinking or damage to conduit finish.

PORTABILITY—A compact unit in factory-built carrying case . . . easily carried to the job and set up. Complete unit with quick-change attachments included in carrying case.

SPEED—Does perfect bending job in 5 minutes. Graduated ram assures exact duplication of any bend on other pipe and conduit. Increases productivity of each man on job.

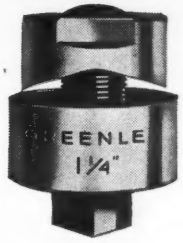
ECONOMY—Leading contractors report labor savings of over 50%; minimum material spoilage; practically no maintenance costs.

TWO MODELS—No. 770 bends conduit from 1¼ to 3 inch. No. 775 especially designed to handle larger size conduit from 3 to 4½ inch. Motor drive attachments available for both units. Get free catalog!



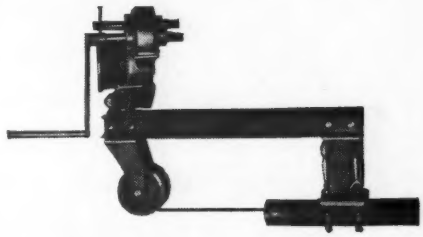
HYDRAULIC PIPE PUSHERS

Install pipe underground for gas, electricity, water, sewers and telephone cable. No tearing up of pavements and lawns, no back-filling, no repaving. One man pumps handle for pressure; hydraulic unit does actual pushing. One compact unit, easy to carry and set up, with 6 speeds for varying soil conditions.



KNOCKOUT TOOLS

In 1½ minutes or less you can cut a hole up to 3½ inches with a GREENLEE Cutter or Punch. Just insert the tool in a knockout or small drilled hole—give a few turns of the drive nut with an ordinary wrench! No drilling or filing. Cut clean, round holes in bakelite, hard rubber or any metal up to ⅛-inch thick.



CABLE PULLERS

Simple, compact unit exerts 7500 lb. maximum pull, has two speeds through direct and back gears. Clamping device fastens direct to conduit—allows pulling in line with conduit, prevents loosening of hangers. To pull from concealed conduit, a flexible elbow attachment makes possible use of Puller without frame.

FREE CATALOG 33E

47-page buying guide contains details on complete line of GREENLEE time-saving tools for electricians, plumbers and carpenters. Keep on hand for quick reference. Be sure to get *your* copy! Write *today*. Greenlee Tool Co., Division of Greenlee Bros. & Co., 1751 Columbia Avenue, Rockford, Illinois.

Get Ready with Greenlee!

REGISTERED TOOLS

GREENLEE

FOR THE CRAFTSMAN

New support from the ground up . . via GraybaR

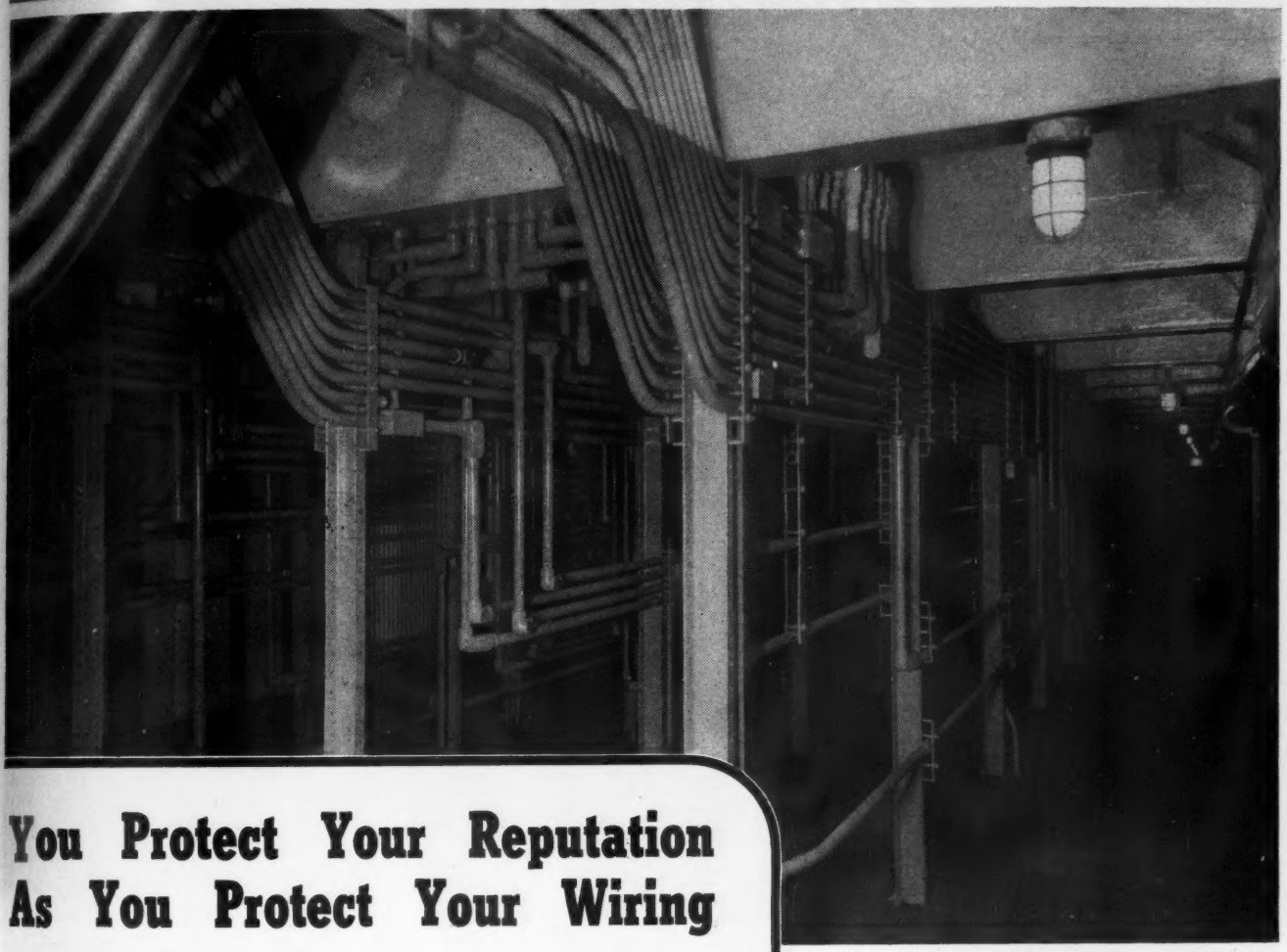
AN UNFAILING ADVANTAGE

Mercoid Controls are widely used in the fields of heating, air conditioning, refrigeration and various industrial applications ● Whatever the control requirement may be, it is conceded that dependable performance is most essential, due to the fact that any equipment governed by an automatic control is more or less dependent upon the control ● The dependability of Mercoid Controls is based upon their fundamental construction and operation. They are equipped exclusively with hermetically sealed mercury switches of special design ● Mercoid mercury switches are known the world over for their dependable service. They are not affected by dust, dirt or corrosion; nor are they subject to open arcing, with its attendant consequences of pitting, sticking or oxidized contact surfaces, all of which, are likely to interfere with normal switch operation ● The Mercoid Switch is one of the principle reasons among other things, why Mercoid Controls on the whole, give the assurance of better control performance and longer control life—a distinct and unfailing advantage —the reason why they are the choice of America's leading engineers for many important wartime industrial applications. ● Catalog sent upon request.

THE MERCOID CORPORATION · 4229 BELMONT AVENUE · CHICAGO · 41 · ILLINOIS

It's time for FOUNDATION-BUILDING

FOR SAFETY'S SAKE . . . USE CONDUIT *(Full Weight Rigid Steel)*



You Protect Your Reputation As You Protect Your Wiring

IN war or peace, Americans judge a man, a machine, or a wiring job by performance--performance not just today, but tomorrow, and for a lifetime.

War shortages and priorities have made necessary certain emergency practices that do not meet the high standards of the National Electrical Code...as in the use of conduit. As every contractor knows, the only code-approved wiring system, designated as moisture-, vapor-, dust-, and explosion-proof, for use in hazardous locations and occupancies is a standard-threaded, rigid steel conduit.

Now, as you rewire for reconversion and wire new jobs for post-war buildings, you can count on using Youngstown Buckeye Conduit--the full-weight, rigid steel which for many years has been first choice of contractors and customers alike. Whenever you use Buckeye you give your wiring the best possible protection, and you likewise protect your own reputation for safe methods and sound practice.

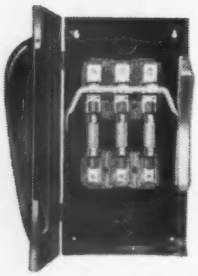
THE YOUNGSTOWN SHEET AND TUBE COMPANY
Youngstown 1, Ohio
Manufacturers of
CARBON, ALLOY AND YOLOY STEELS

BUCKEYE TRADE MARK YOUNGSTOWN CONDUIT

Ask your distributor for:
Youngstown Buckeye Conduit · Pipe and Tubular Products · Sheets · Plates · Electrolytic Tin Plate · Coke Tin Plate · Bars · Rods · Wire · Nails · Tie Plates and Spikes

New support from the ground up.. via GraybaR

Pre-eminent!



Vacu-Break

SAFETY SWITCHES WITH "CLAMPMATIC" CONTACTS

Even if we wished, we could not meet the nation's total demand for Safety Switches . . . But it is gratifying to realize that we are attracting the greater part of the business placed by users who insist on highest quality.

This they get in BullDog with its exclusive Vacu-Break principle of arc suffocation . . . *plus* the Clampmatic feature which assures contacts tight as a bolted connection . . . *plus* stylined cabinets of modern design . . . all at no price penalty! They pay no more but get a lot more!

Capacities from 30 Amp. to 1200 Amp.

BULLDOG

ELECTRIC PRODUCTS COMPANY

BOX 177, R. PK. ANNEX, DETROIT 32, MICHIGAN
In Canada: BullDog Electric Products, Ltd., Toronto
Field Engineering Offices in All Principal Cities

Buy More War Bonds

Also Manufacturers of
SaftoFuse Panelboards—Switchboards—Circuit Master Breakers—BUStribution Duct, for "plug-in" power—Universal Trol-E-Duct, for flexible lighting—Industrial Trol-E-Duct, for movable "loads."

It's time for FOUNDATION-BUILDING

OUT OF 75 YEARS OF ELECTRICAL EXPERIENCE

. . . a wider service than ever for Electrical Contractors

● As uses for electricity have widened in industry, in commerce and the home, electrical contractors have come to require an increasingly *broad-gaged* service of supply. For 75 years, GRAYBAR has been keeping step with electrical growth. After the war, our service will be more complete than ever. Whether you are reconverting a factory, lighting an office, or electrifying a kitchen, GRAYBAR will have all the items that go together on the job. In addition, the aid of experienced Specialists will make it easier for you to plan the most modern installations.

THERE IS A GRAYBAR WAREHOUSE NEAR YOU

Akron
Albany
Allentown
Asheville
Atlanta
Baltimore
Beaumont
Birmingham
Boston
Buffalo
Charlotte
Chattanooga
Chicago
Cincinnati
Cleveland
Columbia, S. C.
Columbus
*Corpus Christi
Dallas
Davenport
Dayton
Denver
Des Moines
Detroit
Duluth
Durham
Flint
Fort Worth
Grand Rapids
Hammond
Harrisburg
Hartford
Houston
Indianapolis
Jacksonville
Kansas City
Knoxville
Lansing
Los Angeles
Louisville
Memphis
Miami
Milwaukee
Minneapolis
Nashville
Newark
New Haven
New Orleans
New York
Norfolk
Oakland
Oklahoma City
Omaha
Orlando
Peoria
Philadelphia
Phoenix
Pittsburgh
Portland, Me.
Portland, Ore.
Providence
Reading
Richmond
Roanoke
Rochester
Sacramento
St. Louis
St. Paul
Salt Lake City
San Antonio
San Diego
San Francisco
Savannah
Seattle
Springfield, Mass.
Spokane
Syracuse
Tacoma
Tampa
Toledo
*Tulsa
Washington
Wichita
Winston-Salem
Worcester
Youngstown
*Sales Office

via GraybaR

EXECUTIVE OFFICES:
Graybar Building, New York 17, N. Y.

New support from the ground up . . *via* GraybaR

FIRMS LIKE THESE ARE THE *Starting Point*

A. L. Smith Iron Company
Appleton Electric Company
Benjamin Electric Manufacturing Company
Bryant Electric Company, The
Bull Dog Electric Products Company
Bussmann Manufacturing Company
Coffing Hoist Company
Curtis Lighting Inc.
Day-Brite Lighting Inc.
Donald P. Mossman, Inc.
Economy Fuse and Manufacturing Co.
Edwards and Company, Incorporated
Faraday Electric Corporation
Frank Adam Electric Company
F. W. Wakefield Brass Company, The
Greenlee Tool Company
Harvey Hubbell, Inc.
Ilg Electric Ventilating Company
Independent Pneumatic Tool Company
Jefferson Electric Company
Justrite Manufacturing Company
Leader Electric Mfg. Corp.
Mercoid Corporation, The
Minerallac Electric Company
Mitchell Manufacturing Co.
National Electric Products Corp.
Revere Electric Mfg. Co.
Simplex Wire & Cable Company
Square D Company
Steel & Tubes, Inc.
Thomas & Betts Company, The
Trumbull Electric Mfg. Co., The
Webster Electric Company
Weston Electrical Instrument Corporation
Wheeler Reflector Company
Youngstown Sheet and Tube Company, The

For today's FOUNDATION-BUILDING

The companies whose products come to you *via Graybar* know how much the electrical contractor needs a convenient, well-stocked local source of supply. Subject to wartime limitations, they are doing their best to see that their products reach you where you need them, when you need them.

For the future, they are planning new tools and materials that will aid the well-qualified electrical contractor to reestablish and extend his profitable peacetime business. For the first and most complete information on what's ahead — keep in touch with your Graybar Man. He'll make your problems his personal responsibility. *Graybar Electric Company, Executive Offices, Graybar Bldg., N. Y. 17.*

GraybaR
IN OVER 80 PRINCIPAL CITIES

GraybaR QUALITY *REG. U.S. PAT. OFF.
75 YEARS OF *Electrical Distribution*

THESE ANNOUNCEMENTS of new equipment are necessarily brief—for more detailed description, sizes, prices and other data write to the manufacturers' advertising departments, tell them in what issue of ELECTRICAL CONTRACTING you saw the item and they will send full details to you.

EQUIPMENT NEWS

Capacitor

G-E. CAPACITOR

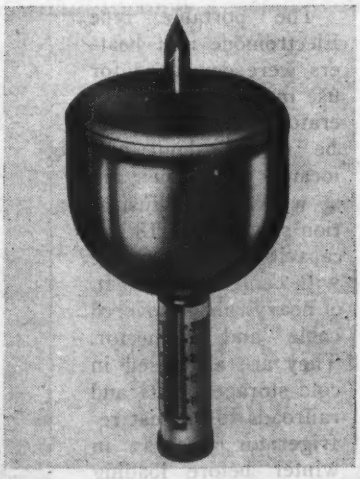
This Pyranol radio - noise - suppression capacitor is specially designed to reduce radio noise voltage from generators, inverters, motors, and other equipment. The capacitors are of the through - stud type with a terminal at each end. One line of a d-c or a-c power circuit can be fed through the unit, reducing internal inductance and resistance, and increasing filter efficiency for a given capacitance. The physical dimensions are approximately 1¾ by 3⅝ in. and the unit weighs 4½ ounces. It can be mounted in any position and will operate over a temperature range of plus 50 deg. C. to minus 50 deg. C. They are rated 0-100 amp., 250 volts maximum a-c or d-c, 0.55 microfarad. General Electric Company, Schenectady 5, New York.

Power Circuit Transformers

JEFFERSON TRANSFORMER

Power circuit transformers in capacities from 100 to 750 watts are now available with circuit breakers for overload and short-circuit protection. Transformers of these capacities are used mounted directly on machines to step down the 550, 440, or 220 volts to 110 volts for various electrical appliances and localized lights. Flexible cable or conduit may be run from wiring compartment to motor or appliance. Transformers can be furnished with on and off switch and receptacle in the wiring compartment. The circuit breaker is tamper-proof being completely housed in a transformer case with a reset button extending. For 25 to 75 watt transformers with their light loads, glass enclosed fuses are provided in place of circuit breakers. Jefferson Electric Company, Bellwood, Illinois.

Instrument



STANDARD TACHOMETER

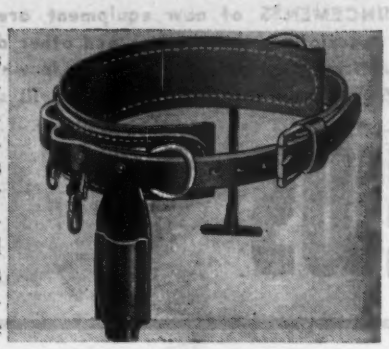
This new Tachometer weighs 5½ oz. and is 2¼-in. diameter, which permits one hand manipulation. The recording in r.p.m. is read without the use of any timing or counting device. The readings are constant and record fluctuations which are impossible with tachometers now on the market. The scale is made up of black figures against an orange background. The range of this instrument runs from 500 to 3000 r.p.m. A pointed contact spindle is a part of the instrument for use with shafts that are centered and an elastic tip is furnished that will slip over the pointed spindle for use on shaft ends that are not centered. The tachometer is dust and moisture proof and has a baked enamel protective coating on all surfaces except the scale. The Standard Machinery Company, Providence, R. I.

Solderless Terminal

SHERMAN UNI-CRIMP

This solderless terminal has been developed for all small wire connections such as aircraft, radio, electronics, switchboards, automotives etc. Known as the "Uni-Crimp", it is fully interchangeable with other terminals of this type. It can be installed with hand crimping pliers, or standard types of indenting dies. Two indentations across the barrel of the terminal attach it permanently to the wire. Terminals are made from copper, are of one-piece construction, with insulation support wings. Three styles are available—No. UC-18-B for Nos. 18, 20 and 22 gage wire; No. UC-14-B, for Nos. 14, 16 and 18 gage wire; and No. UC-10-B, for Nos. 10 and 12 gage wire. H. B. Sherman Manufacturing Company, Battle Creek, Mich.

Tool Belt



KLEIN-KORD

This new lineman's belt is made of a specially developed material called Klein-Kord. The material consists of multi-ply, specially woven long staple cotton laid in rubber and vulcanized. It is claimed to be waterproof, has a tensile strength many times that demanded in actual service, and possesses uniform quality, and flexibility. The cross cords are extra strength, which makes it possible to punch holes in the belt strap without danger of ripping under strain. This permits the use of a positive action, tongue-type buckle and does away with the necessity of using the dangerous friction-type buckle. The belt construction is a 2-inch wide body strap riveted to the 4-in. wide belt forming four tool loops. It has a 4½-in. canvas lining. "D" rings of solid steel drop forgings are mounted in steel safety clips which are riveted through the main belt. Mathias Klein & Sons, 4200 Belmont Ave., Chicago 18, Ill.

Fluorescent Fixture

SPERO FIXTURE

This newly designed fluorescent fixture is recommended for any commercial installation. The light from the four 40-watt tubes is shielded by evenly spaced egg-crate louvers, minimizing glare. Reflecting surfaces, finished in "Plastox" white are so arranged as to eliminate trapped light resulting in high intensity with low surface brightness. Plastic side panels shield end tubes and contribute to appearance. They are made for stem or flush mounting. For stem mounting, unit is equipped with a ceiling canopy. Louvers are hinged for easy and quick maintenance. The unit is designated Spero LVR-448, and is available with Spero Insta-Lite. The Spero Electric Corporation, 18220 Lanken Avenue, Cleveland, Ohio.

Expansion Fitting

This new type expansion fitting is shorter and more compact than previous types. It requires fewer parts and is easy to install. The standard finish is cadmium plated, but it can also be furnished in bronze. It was designed to compensate for expansion and contraction in a line of conduit. The head is sealed by a special packing to keep out water or moisture and is suitable for use on bridges, tunnels, dams or any construction where long lines of conduits must be installed. O. Z. Electrical Manufacturing Co., 252 Bond St., Brooklyn, N. Y.

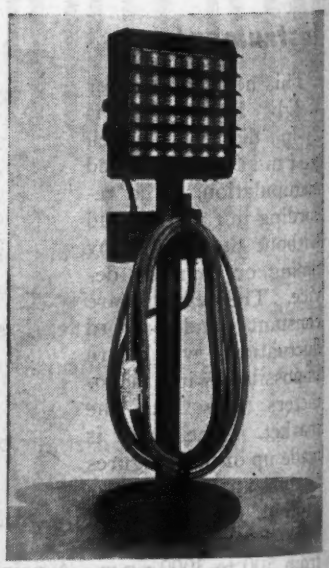
O. Z. FITTING

Capacitor

FLUORESCENT CAPACITOR

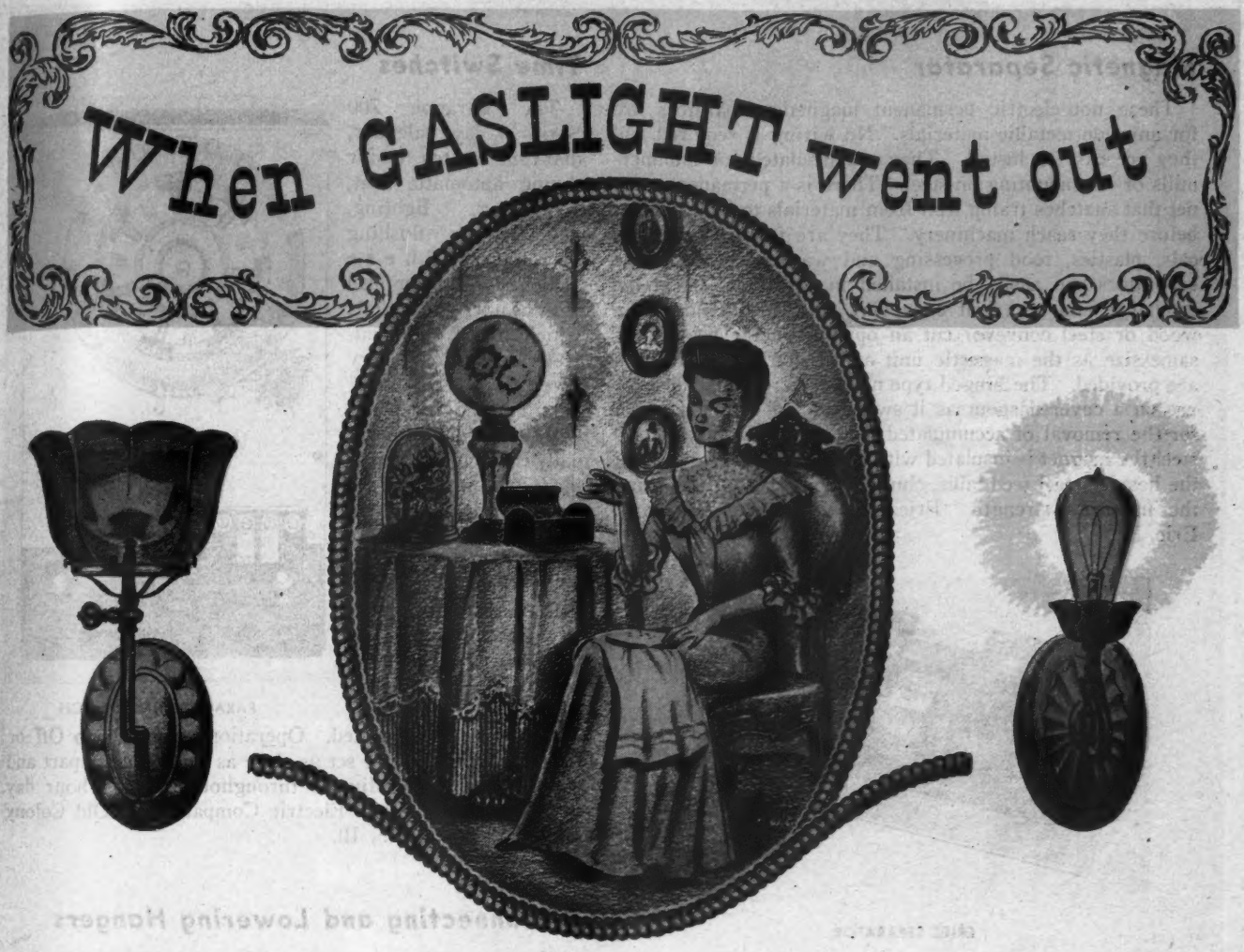
Several electrical and mechanical features highspot these oil-impregnated fluorescent ballast capacitors. They are dried, impregnated, filled and sealed without contact by human hands, to avoid all possibility of body acid contamination. A process of mechanical sealing eliminates high temperature oil leaks. All units are built for continuous service at 85 deg. C. and have less than two percent power factor at the high operating temperatures encountered in fluorescent ballasts. The Fluorescent Lighting Division of The Capacitron Company, 318 West Schiller Street, Chicago 10, Ill.

Portable Electric Unit Heaters



ELECTROMODE HEATERS

The portable type Electromode unit heaters were developed for use in control and generator rooms. They can be moved about and located where men are at work. The illustration shown is an 18 kw. capacity heater complete with controls and 50 ft. of heavy rubber-covered cable and connector. They are also used in cold storage plants and railroads to preheat refrigerator cars in winter before loading canned goods to prevent freezing in transport. The heating elements used in these portable models are of the standard patented Electromode construction with sheathed resistor sealed in a one-piece finned aluminum casting with a motor-driven fan mounted directly behind the elements. Electric Air Heater Company, Mishawaka, Ind.



ARMORED CABLE *came in . . . to stay*

Nearly half a century ago, Armored Cable became a recognized standard wiring assembly. Combining insulated wires and a flexible steel conduit as it does, in one unit, no other system is safer, more reliable, or easier to install.

The Type R wires — two, three or four conductors, in sizes No. 14 AWG to No. 2 AWG — are twisted together, paper wrapped and efficiently protected by the interlocking flexible steel armor, which is zinc coated in order to resist rust.

Armored Cable has been used consistently for original wiring and extensions in homes and business buildings, and for machine connections in factories.

Send for Book No. 189 describing all varieties of Armored Cable and giving valuable information on how to install properly. Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

Armored Cable forms a perfect means for providing the additional circuits and outlets needed to bring existing homes up to the Adequate Wiring Standard.

ADEQUATE WIRING — THE KEY TO INCREASED PRODUCTION — SERVICE SAVES

ARMY E NAVY

HAZARD

INSULATED WIRES AND CABLES

for every electrical use

3779

Magnetic Separator

These non-electric permanent magnetic separators are for any non-metallic materials. No wiring is required and they are easy to install. They are insulated for hammermills or for mounting on steel. There is a permanent magnet that snatches tramp iron from materials to be processed before they reach machinery. They are for use in chemicals, plastics, food processing and war industries. The separators can easily be installed in a short chute at the discharge end of a belt conveyor. For installation on a wood or steel conveyor cut an opening in the bottom the same size as the magnetic unit and fasten with bolts that are provided. The hinged type magnet is recommended for use on a covered spout as it swings down from the spout for the removal of accumulated metal. For installation on steel the magnet is insulated with brass or copper to prevent the heavier steel feed table, chute or hopper from absorbing the magnet's strength. Eriez Manufacturing Company, Erie, Pa.

ERIEZ SEPARATOR

Circuit Breaker

A new and improved single pole circuit breaker for 240 volts a.c. and 125 volts d.c., 50 ampere maximum has been announced. It may be front connected or rear connected. This breaker has instantaneous trip or a selection of three time delays. Overall dimensions are 5¼-in. long by 2⅛-in. high and 1½-in. wide. The Heinemann Circuit Breaker Company, 132 Plum Street, Trenton, N. J.

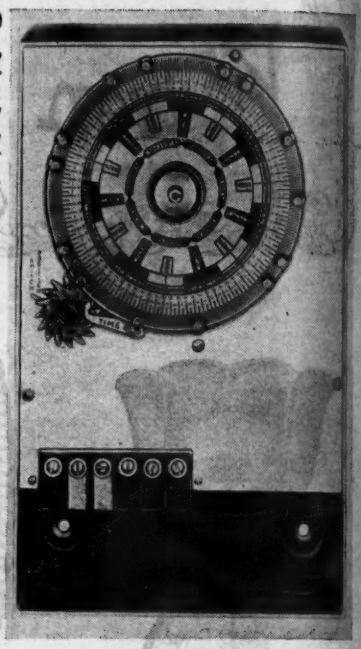
HEINEMANN CIRCUIT BREAKER

Insulating Varnish

A new impregnating insulating varnish for all types of electrical windings known as Synthite PG-4-FC clear baking varnish, protects each layer of wire. Therefore, if the surface of the winding is damaged in rough handling, the fungicidal protection of the varnish is still retained. It is adaptable for use on the modern types of polyvinyl acetal coatings of magnet wire. It may also be used on glass insulation which is recommended for units having high temperature rises. It is also suitable for use on other types of Class "B" insulation as well as textile tapes. John C. Dolph Company, 168 Emmett Street, Newark 5, N. J.

Time Switches

The Paragon 700 Series 7-day calendar, dial-time switch is for timing automatic heat, ventilating, lighting, pumping or flushing operations. These switches are equipped with 6-in. calendar dials which make one complete revolution every seven days. Dial trippers can be independently set for different daily On and Off schedules. Settings can be made in advance for an entire week. Any day or days operations may be omitted entirely on a pre-set program. Each day of week clearly separated from other days; graduated into hours and half hours; day and night distinctly separated. Operations from On to Off or from Off to On can be set as close as three hours apart and can be separately adjusted throughout each 24 hour day in the week. Paragon Electric Company, 710 Old Colony Building, Chicago 5, Ill.

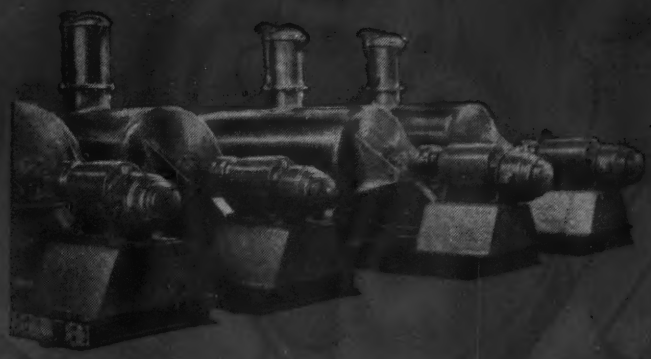


PARAGON TIME SWITCH

Disconnecting and Lowering Hangers

This line of disconnecting and lowering hangers has been improved and simplified. All standard general-purpose two-contact type hangers for single two-wire circuits are now supplied with an improved two-hole threaded porcelain bushing and conduit lock nut so that all of these hangers are suitable for either open or conduit wiring. For open wiring, the two-hole porcelain bushing provides an approved entrance method. Where wiring is to be in conduit, the porcelain bushing is removed and a ¾ in. conduit is secured in place by means of the standard ¾ in. lock nut used to secure the bushing in place. Hangers are for complete washing and relamping of indoor or outdoor high-positioned lighting equipment, at ground or floor levels, by one man, free from all climbing and electrical hazard, and without the use of ladders, scaffolds or platforms. The Thompson Electric Company, 1101 Power Avenue, Cleveland 14, Ohio.

THOMPSON HANGER



more gearhead motors in use today bear the MASTER name than all other makes ...COMBINED

MASTER

THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO

ARE YOU LOSING DOLLARS? Check these Big Markets for new lamp sales . . . and watch your Profits jump!

32% of all stores lighted with fluorescent need immediate lamp replacements, according to a recent G-E survey. Starter replacement also offers many opportunities.

One out of 11 homes now has fluorescent lighting in one or more rooms—already an appreciable market for replacement business that is sure to increase.

Almost 2 billion square feet of industrial plant area are lighted with fluorescent. But 68% of all factory space still needs better lighting. A big opportunity for lamp replacements and new business.

Hear the General Electric radio programs: "The G-E All-Girl Orchestra", Sunday 10 p. m. EWT, NBC; "The World Today" news, every weekday 6:45 p. m. EWT, CBS.

GENERAL ELECTRIC

simple plan to help you fluorescent lamps!

NOW you can make greater lamp sales and profits with this new G-E Dealer program

It's a brand new program that fits today's big profit opportunities for lamp replacement business. It's complete . . . compact . . . filled with ideas that really *sell!* It's a step-by-step program you can use *now* . . . with all the up-to-the-minute merchandising and sales helps needed to move more G-E Fluorescent lamps faster. It's a money-maker, aimed for folks now selling fluorescent lamps . . . and others who want to.

HERE'S THE NEW G-E PROGRAM

Perfectly timed to meet today's tremendous demand for fluorescent lamp replacements, this program offers a complete package including a special folder addressed to contractors—*plus* new sales helps—*plus* folders, statement enclosures and other practical promotion material, to sell more G-E lamps.

There's a ready-made market awaiting a program like this one—and General Electric now furnishes everything you need to cash in on it. Better get in early—see your G-E Lamp Distributor for your copy—today.

HERE'S ALL YOU DO TO START THE PROFITS ROLLING IN

Get in on the profitable lamp renewal business, but get in soundly—by taking these three steps:

1 **GET ALL THE FACTS** presented in the G-E sales program: Point out to customers both the immediate and long-range profit opportunities in lamp renewals.

2 **SOLICIT INDUSTRIAL** plants, offices and stores. Urge your customers to give you a line on reconversion plans, renewal dates, and future lighting requirements, as well as present replacement needs.

Shorter days ahead mean longer burning hours—and better renewal business. Are you ready? Ask your G-E Lamp Distributor about this new plan—now.

"TO MAKE G-E LAMPS STAY BRIGHTER LONGER"
The Constant Aim of G-E LAMP RESEARCH

BUY MORE WAR BONDS—AND HOLD 'EM

G-E MAZDA LAMPS

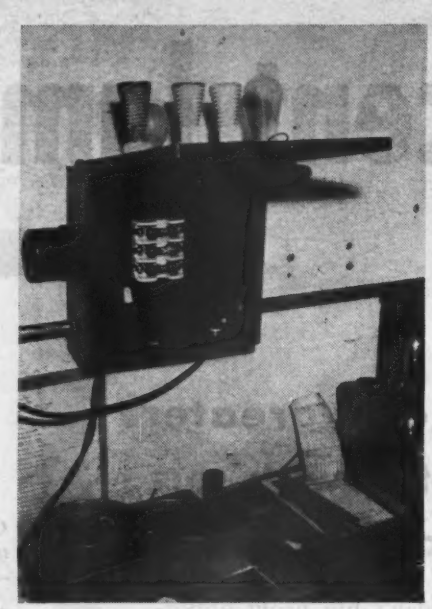
MOTOR SHOPS

BENCH TEST UNITS

Each work bench is equipped with a test unit, scale and prony brake to meet all test requirements in the motor repair shop of Walter J. Rider, Binghamton, N. Y.

Mounted on the wall at the end of the benches are 10- by 10- by 4-inch pull boxes, each supplied with 110/220 volts single phase. On the side of the box is a three-way switch to provide the tester with either voltage to suit his requirements. On the top of the box is a 220 volt indicator lamp which burns dimly on 110 volts and brightly on 220 volts. In the cover of the box is mounted four lamp sockets for use with either lamps or resistor units. In the bottom of the box is mounted another three-way switch to energize either of two sets of test leads. A fuse block is mounted within the box.

Thus each tester has at his convenience equipment to make ground, short-circuit, continuity and running tests at either 110 or 220 volts. He can obtain either voltage with either set of test leads. The one set, when energized by the three-way switch, will have in series with it the four lamp sockets mounted in the cover of the box. The other set of test leads are connected directly across-the-line (when energized by the switch) for a running test.



PULL BOX contains all the single phase requirements for running and series tests. Two 3-way switches provide either 110 or 220 volts to either a set of running test leads or a set of series test leads.

Each work bench is partitioned longitudinally, so that two men can work on either side of the same bench and still have ample working space as shown by the accompanying photo. A short overhead trolley carries a set of scales and prony brake with chain attachment so that both workers can use the same scales in making running tests. The lever arm of the brake is calibrated and each worker is supplied with a loading chart so that motors of different ratings can be loaded to meet the testing specifications. A set of four testing pulleys is provided to easily fit the four common shaft sizes in single phase motors of horsepower rating $\frac{1}{10}$ to 2 hp. at 1750 or 1150 rpm.

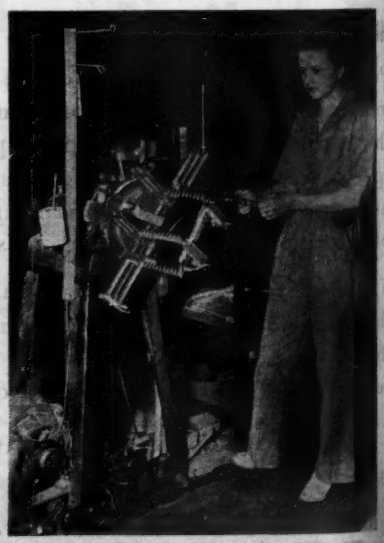
The brake is first tightened and adjusted by a hand screw until the scale indicates that full load is being applied. The motor is then stopped and started several times to make sure that the starter mechanisms are operating correctly. The load is then run up to 100 percent overload to insure sufficient pull-out torque. The prony brake is then removed and a dead spot check is made by hand.

Heavy equipment testing is done on a large board where originally all testing was carried on. However, the large board became a serious bottleneck and so Walter decided to provide single phase test equipment to each work bench.

COILS SLIP OFF THE SMOOTH SIDE

George Larson, chief engineer of the R. A. Reed Electric Co., Los Angeles is the originator of a feature in connection with the fingers on his coil

LOAD TESTS are made with scales and prony brake. Lever arm is calibrated and chart (pasted on test unit cover) tells operator how many pounds and ounces must register on scales to apply full load. Brake is tightened, and thus load is increased, by a hand-tightening screw.



DURING WINDING, the dividers on the winding head fingers are turned outward as shown in the accompanying photograph.

CROCKER-WHEELER MOTORS for ALL INDUSTRY

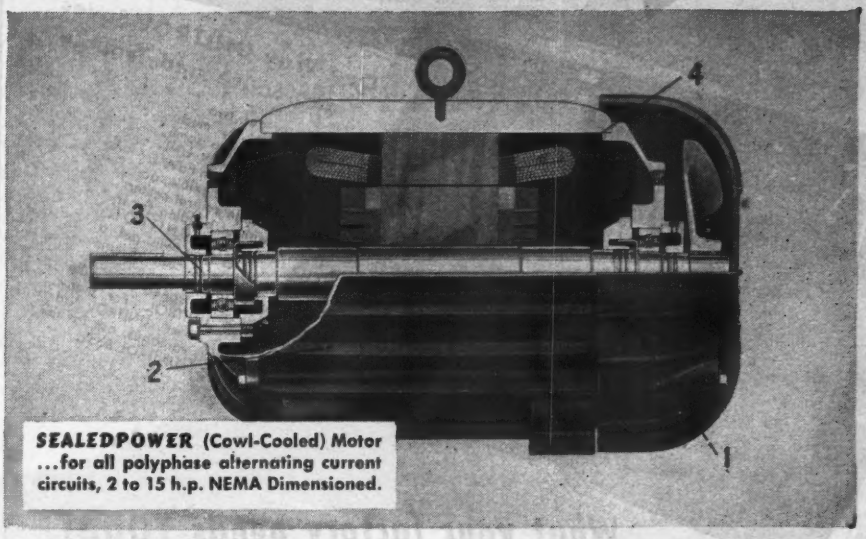
FEATURES

1. Totally Enclosed Cowl-Cooled type minimizes fire hazard, resists corrosion. Protects against acid or alkali fumes, splashing or dripping corrosive liquids, air-borne moisture, steam, corrosive gases, conducting dusts, metallic chips, lint, etc.

2. Fin Type single shell construction, with all surfaces exposed and a readily removable fan shroud, gives non-clog ventilation. Easy to clean...foreign matter passes over the surfaces of and not through the motor.

3. Patented GROOVSEAL antifriction bearings—no greasing needed for at least a year—minimizes maintenance. Seal permits use of softer grease, for better lubrication and longer bearing life. Water-tight—Dust-tight—Air-tight.

4. Vacuum Impregnation with high grade insulating varnish seals out foreign matter and moisture from each individual coil...makes windings a homogenous mass...reduces hot-spot temperature and lengthens insulation life. Adherence of varnish prevents vibration of wires inside or outside of slot.



SEALEDPOWER (Cowl-Cooled) Motor ...for all polyphase alternating current circuits, 2 to 15 h.p. NEMA Dimensioned.

SEALEDPOWER...Industry's Most Trouble-Free Motor

because...

YOU CAN DEPEND on a Crocker-Wheeler field engineer to recommend the power equipment *you need.* Behind him is *56 years* of our company's experience...*56 years* of continuously developing facilities and skills *exclusively* in the power field.

Crocker-Wheeler, one of the leading companies in the field, specializes SOLELY in the design manufacture and application of electric power equipment.

As power SPECIALISTS, Crocker-Wheeler field engineers know the power needs of your industry—of your particular production processes. Call in one of our experienced engineers for specific advice on motors, generators, control and couplings... no obligation.

JOSHUA HENDY IRON WORKS

CROCKER-WHEELER DIVISION

ESTABLISHED 1856

AMPERE, NEW JERSEY

Branch Offices: BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • NEW YORK • PHILADELPHIA • PITTSBURGH • SAN FRANCISCO • WASHINGTON • LOS ANGELES

What your factory needs TODAY
What it must have TOMORROW . . .

UNITROL

● Wondering what you can do about more plant space? Wondering how to get more work out of an already over-burdened electrical maintenance crew? Wondering how to be best prepared for the production layout your plant will require tomorrow? UNITROL can contribute a great deal to the solution of these and many other vexing production, design and maintenance problems. UNITROL may disclose important space you didn't know you had. UNITROL can lift a big load off the shoulders of harried, hurried electrical men. UNITROL will help you to many short cuts in shifting, changing, replacing or rebuilding your plants' motor control facilities in line with changing needs. If you don't know *all about* this pioneering, unitized, sectionalized method of mounting, housing and centralizing motor control, a request for the UNITROL Book should be your first order of business. Many of today's leading plants say UNITROL is the next step forward in modern motor control practice; the UNITROL Book has a wealth of time, money and work saving ideas. Send for a copy today . . . CUTLER-HAMMER, Inc., 1306 St. Paul Ave., Milwaukee, 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ont.

UNITROL and your filing cabinet system have much in common

You can easily change the contents in any drawer of your filing cabinets. You can easily add, subtract or change sections. And you can easily go from one drawer to another. UNITROL is that kind of a cabinet filing system for Motor Control . . . its value to any plant already proved in hundreds of plants.

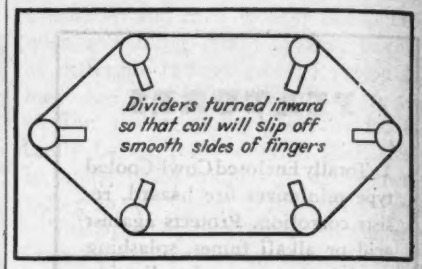
CUTLER-HAMMER
UNITROL
C-H

Copyright 1944, Cutler-Hammer, Inc.

Engineering Excellence Finds its Greatest Reward in the Respect and Confidence of those it Serves

winding machines that saves much time. The feature of this type of winding head is that the fingers seat on conical bearings at the inner end. As shown in the photograph, when in position for winding, the dividers on the fingers are turned outward to hold the coils.

Winding then proceeds, switching from one coil to the next without cutting the wire. When the winding of the group is completed, the fingers are loosened on the cones and turned 180 degrees, so that the dividers point inward and the coils can be slipped off the smooth sides of the fingers (see sketch).



BY TURNING the fingers 180 degree on their conical bearings, the dividers point inward and coil can be slipped off.

JIGS FOR SLOTTING COMMUTATOR BARS ON BAND SAW

Slotting commutator risers on a band saw just wasn't being done and furthermore couldn't be done. At least that's what engineers told Walter J. Rider, owner of a Binghamton, N. Y. motor repair shop. So Walter immediately designed a jig that would do it. In rewinding a great number of

JIG FOR SLOTTING commutator bars on a band saw. Vertical commutator being set in place for slotting. Concentric bronze ring supports risers while being cut.

CRISIS AT THE JENKINS FACTORY!

Factory Inspector finds a roll of Gold Seal Tape that RAVELS!

Jenkins Bros. also make Diamond Seal Friction and Rubber Tapes which meet ASTM and Federal Specifications

There sure would be a crisis if a defective roll of GOLD SEAL Friction Tape ever got as far as this without being spotted . . . but there isn't a chance of that ever happening!

For Jenkins controls GOLD SEAL Tape quality every step of its cautious way from start to finish . . . checks tensile strength of the base cloth . . . tests each batch of compound . . . sees to it that this tape has just the right tack to *stick to the job* (without sticking to the hands!) . . .

Even when each roll is as right as rigid control can make it, it's snugly sealed in cellophane to make sure it reaches you factory-fresh . . . from Jenkins Bros., Rubber Division, 80 White Street, New York 13, N. Y.

JENKINS

TRADE JENKINS MARK

Jenkins Bros.

Gold Seal Tapes

FRICTION and RUBBER TAPES

MADE BY JENKINS BROS. . . . MAKERS OF FAMOUS JENKINS VALVES

● RUBBER POWER CABLES ● VARNISHED CAMBRIC CABLES ● PERMACORD ● LEAD-ENCASED AND PARKWAY CABLES ● SYNTHOL WIRES ● WELDING CABLES ● SHIPBOARD CABLES ● IMPERIAL NEOPRENE JACKETED PORTABLE CABLES ● ARMORED CABLE ● CRESFLEX NON-METALLIC SHEATHED CABLE ● SERVICE ENTRANCE CABLE ● BUILDING WIRE ●

CRESFLEX

NON-METALLIC SHEATHED CABLE

FACTORY ASSEMBLED AND TESTED

EASILY INSTALLED AT LOWEST COST

TOUGH PAPER ARMOR

WEATHERPROOF FLAME-RETARDING JACKET

PARTICULARLY SUITED FOR WIRING FARM BUILDINGS, WAR-HOUSING

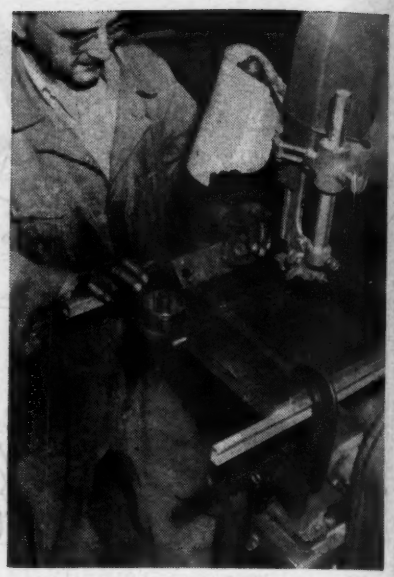
CRESCENT

WIRE and CABLE

NEMA

CRESCENT INSULATED WIRE & CABLE CO.

TRENTON, N. J.



HORIZONTAL TYPE *commutator being slotted on the same jig which has been reversed. Table guide assures correct centering. Set of saw teeth determines slot width. Stop-block gives uniform depth.*

identical motors to a heavier capacity, an increase in wire size required a larger slot in the commutator bar.

The accompanying photograph shows one of the jigs described. The band saw uses a special half-inch metal cutting blade for use on copper. The "set" of the saw-teeth determine the width of the slot and so it is very important that a close check be kept and reset as often as necessary. The depth of the cut is, of course, determined by the distance the blade is allowed to penetrate the riser. A stop-blocked-clamped to the table will give uniform depth.

Each jig accommodates the two types of commutators both having the same bore. In one position with the steel guide bar in place, the jig will cut a vertical riser type commutator. By turning the jig around it will cut an angle slot on the horizontal type of commutators (see photos).

The vertical jig consists of a center pin and a concentric bronze ring which is slotted. The center pin is of very slightly less diameter than the commutator bore. A good snug fit is required to get a clean cut slot. The bronze concentric ring is bolted to the jig base and is used to support the risers while being cut to avoid breakage. The ring is slotted only wide enough to escape cutting by the saw blade. The metal guide gives assurance that the ring will not be hit by the blade.

The horizontal jig consists only of a pin mounted on the correct angle to give an acceptable slot for soldering the commutator lead. The second photo shows the horizontal commutator in place ready for slotting.


CENTRAL
RIGID STEEL
CONDUIT
CENLACO (HOT DIPPED)
CENTRAL BLACK
"There's Tested Strength in Every Length"
SPANG-CHALFANT
Division of The National Supply Company
Executive Offices: Grant Building, Pittsburgh, Pa.
District Offices and Sales Representatives in Principal Cities


THE MORE
THE MORE
MAZDA
WESTINGHOUSE
B-R-I-G-H-T
FROM END TO END

SPARKLE IN THE POWDER . . .

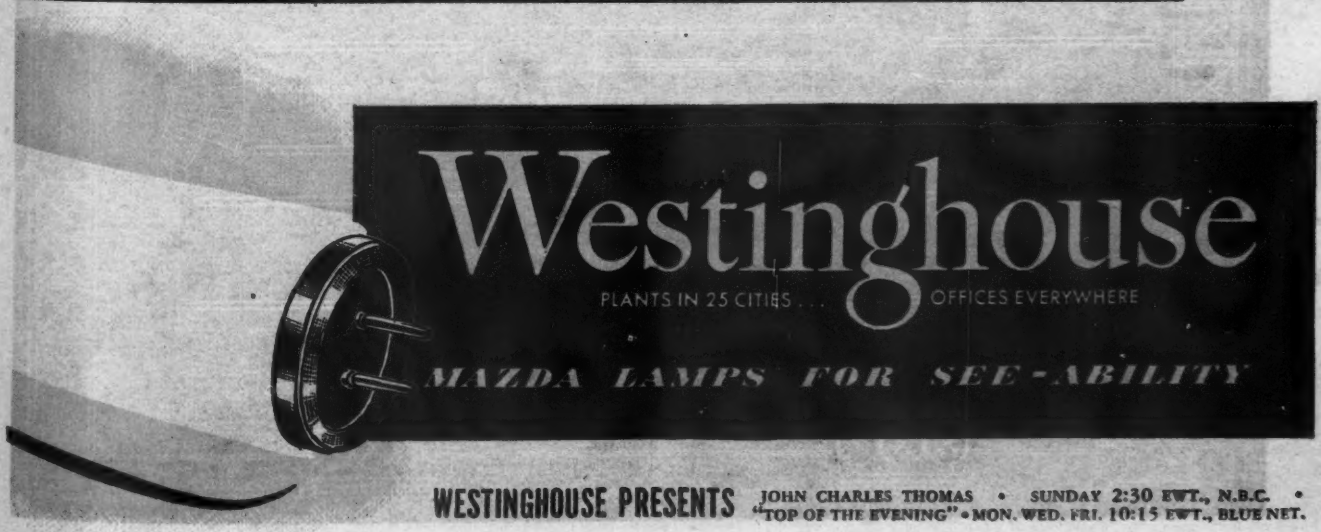
The greater the care in selection and compounding of phosphor powders for fluorescent lamps, the greater the brightness from the lamp, and the more See-ability the lamp produces in service.

Westinghouse research engineers found, for example, that foreign substances in a batch —*just one part in a million*—make an appreciable difference in light output.

To eliminate these impurities, Westinghouse research has devised new and effective purification processes. A carefully planned and meticulously controlled routine of acid washing, high-temperature firing, grinding, mixing and blending, assures maximum purity and brightness performance in the finished phosphor.

To give your customers better See-ability, recommend bright, long-lasting Westinghouse Mazda Lamps for every lighting application and installation. Westinghouse Electric & Manufacturing Company, Bloomfield, New Jersey.

SEE-ABILITY FROM THE LAMP



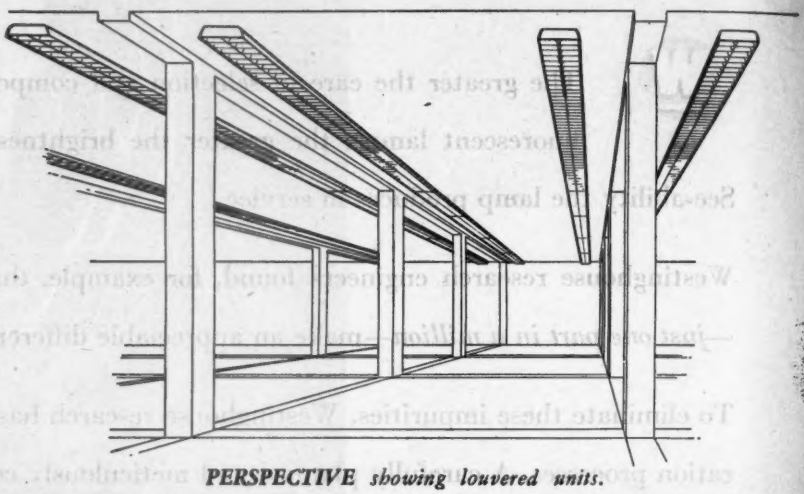
WESTINGHOUSE PRESENTS JOHN CHARLES THOMAS • SUNDAY 2:30 EWT., N.B.C. • "TOP OF THE EVENING" • MON. WED. FRI. 10:15 EWT., BLUE NET.

MODERN LIGHTING

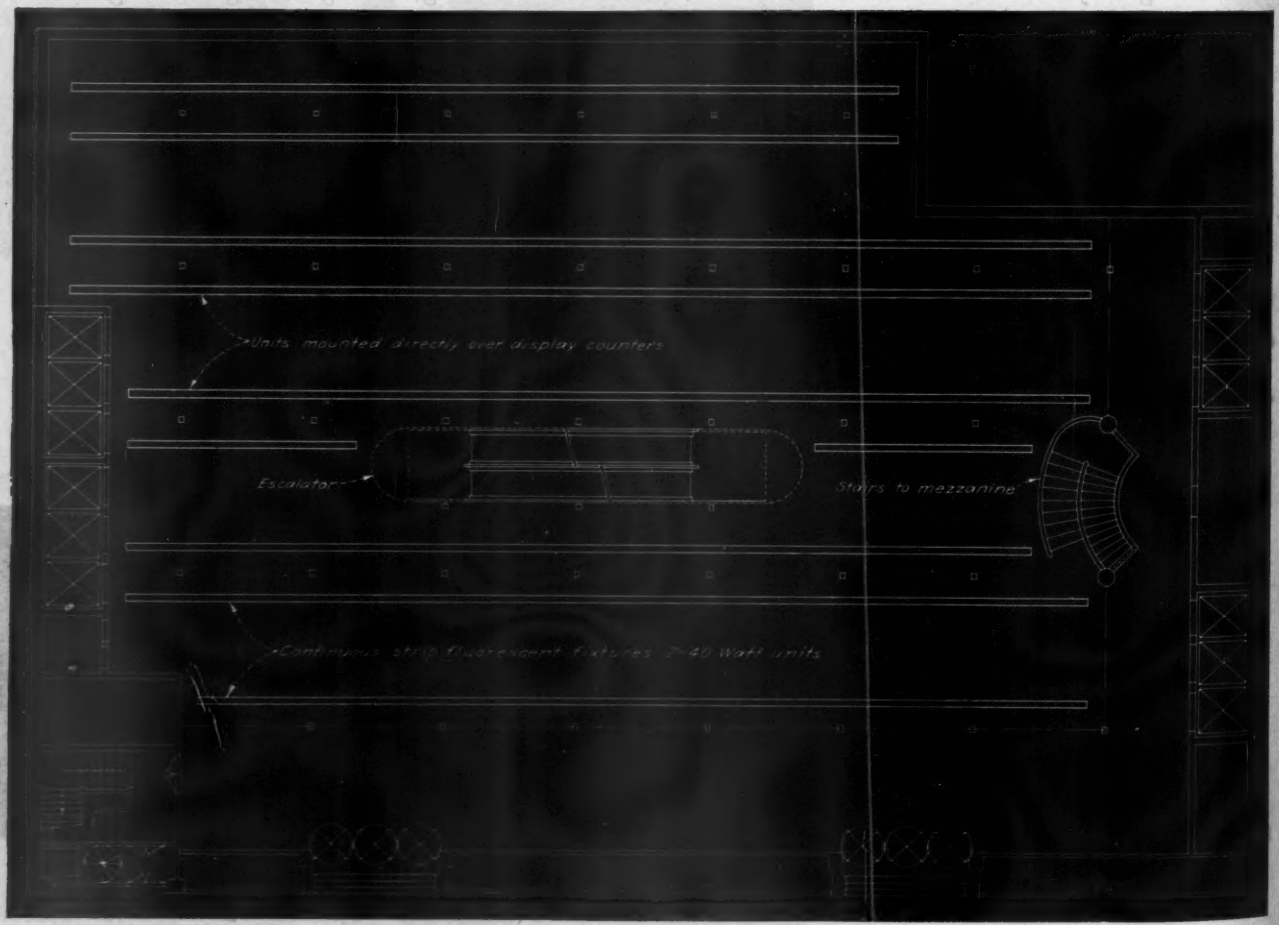
CASE STUDY IN DEPARTMENT STORE LIGHTING

The merchandising of goods and materials, clothing, jewelry, accessories and the like becomes much easier when high quality illumination is used to bring out color and texture to the point of selling itself. Department store executives are fast becoming aware that nothing but the best in lighting is necessary to sell customers and keep them sold. A tremendous amount of store modernization is already in the blue-print stage awaiting the war's end and availability of materials. In the vast majority of cases, new lighting constitutes the most important item in the rehabilitation appropriations.

One of New England's largest department stores is ready with plans for completely relighting their entire merchandising space. It has been decided that fluorescent will be installed as per the plans illustrated here. Incandescent spots mounted on columns or ceilings have undergone quite a bit of discussion but are not as yet specified. However, before alterations take place, if spots seem advisable to highlight certain articles, they may be incorporated into present plans. The advantages of combination lighting lies in its ability to attract attention, and to get maximum color distinction. Combination lighting will give much better

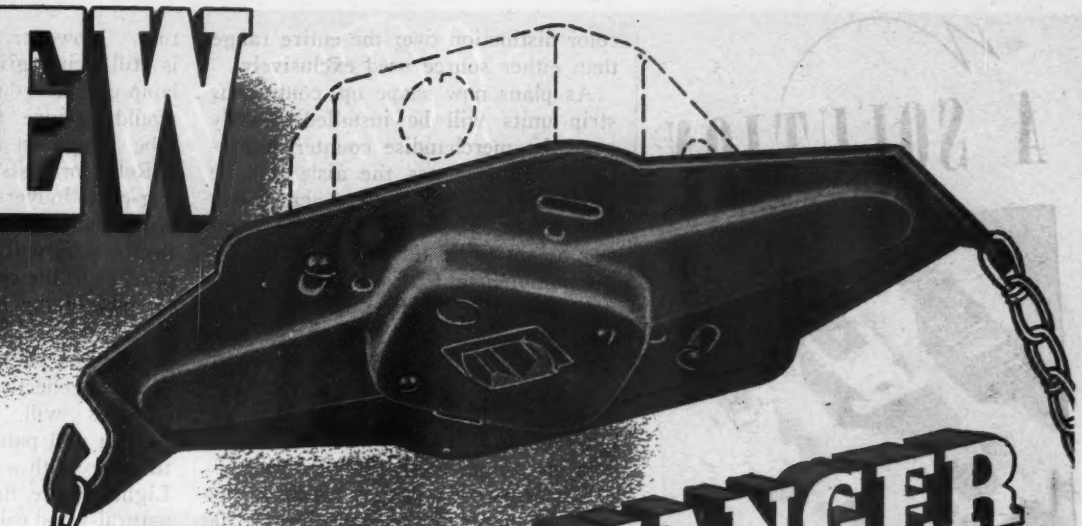


PERSPECTIVE showing louvered units.



PLAN VIEW of first floor lighting.

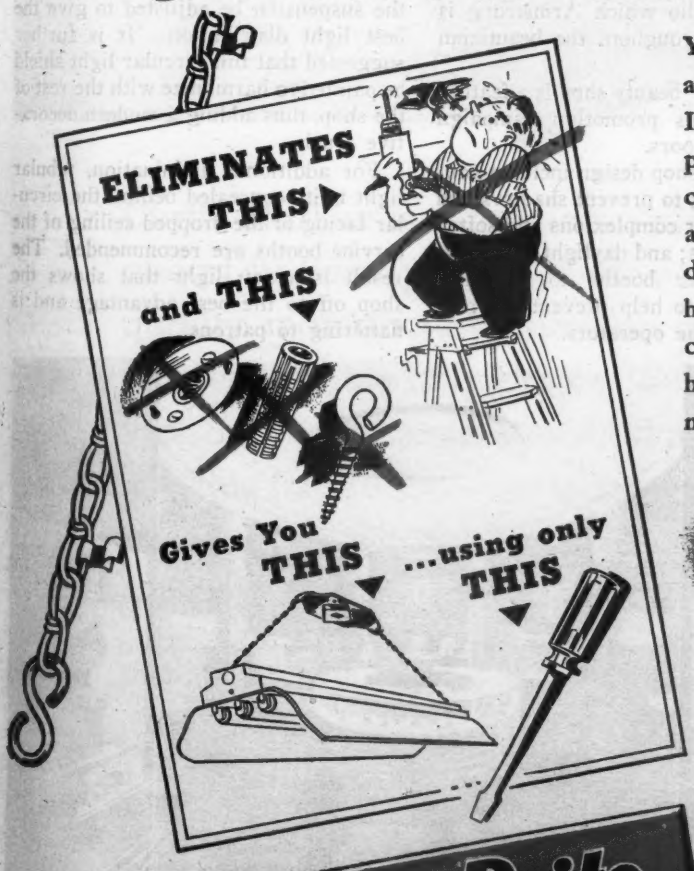
NEW



Patent Applied for
UNDERWRITERS APPROVED

HYDEE HANGER *for* INDUSTRIAL FIXTURES

SAVES *Dollars* ON EVERY INSTALLATION



You need only a screwdriver to save installation time and money — because the new HYDEE Hanger for Industrial Fixtures does away entirely with centering, positioning, punching or drilling holes for mounting chain-suspension fixtures . . . All that's necessary on any job is to make your wiring connections — screw down the hanger to the ears of the outlet box — then hang your fixture . . . Suspension chains, "S" hooks, cord clips and receptacle are furnished with the hanger. Chain hangers furnish accepted ground connections and *allow the use of two-wire cord and plug.*

Simple · Easy · Quick

The HYDEE Hanger can be attached to a 4-in. outlet box — slots allow 15° adjustment. Also fits 3¼-in. outlet box or plaster ring. Receptacle for 2-prong plug (15A-125V, 10A-250V) . . . Complete with two 5-foot chains, cord clips, "S" hooks and receptacle.

— Underwriters Approved —

$1.50 LIST PRICE

Day Brite LIGHTING FIXTURES

DAY-BRITE LIGHTING, INC.
5436 Bulwer Avenue • St. Louis 7, Missouri

Nationally distributed through all leading electrical supply houses

81

A SOLUTION

FOR YOUR SWITCH PROBLEM

If you need a switch — whether for residential or industrial use — consult your P&S Catalog. T-rated, specification types—low-cost (residential) types — for use singly or in combinations—brown or ivory, lock type, luminous or metal handles. All precision-made — all backed by over 50 years' experience in the manufacture of wiring devices.

Send for your copy of our No. 42 Catalog

Sold Thru Electrical Wholesalers

P&S

PASS & SEYMOUR, INC.
SYRACUSE 9, N. Y.

color distinction over the entire range than either source used exclusively.

As plans now shape up, continuous strip units will be installed directly over the merchandise counters. Fixture centers across the aisle will be 14½ feet. Fixture centers across column center-lines will be 8½ feet. Mounting height to be 18 feet.

Counter-height foot-candles will average around 30 ft.-c. of maintained illumination without any supplementary spotlighting. If spots are used, the general illumination will remain approximately the same, with the supplementary light concentrated on specific points in the display area.

The proposed design specifies two 40-watt hot cathode fluorescent 3500 degree white tubes, per four foot fixture. However, serious consideration is still being given a single 100-watt lamp unit to reduce maintenance. This would require the handling of one tube as against two.

Reflector units will be equipped with egg-crate louvers to shield eye contact with the light source. Plastic reflector sides will permit light ray transmission to the ceiling in the immediate vicinity of the fixture.

Ceilings will be finished in a smooth plaster and painted with a white paint of good reflection quality. Walls and columns will likewise be finished smooth and painted in a light neutral tint also with a good reflection factor. Light marble floors and light colored natural-wood cabinets and counters will complete the interior decoration.

BEAUTY SHOP LIGHTING DESIGN

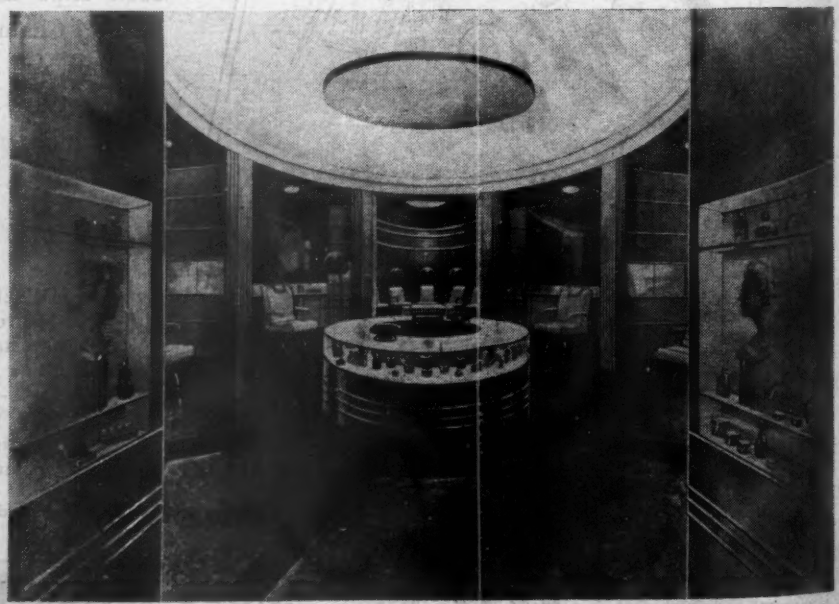
The subject of illumination is strongly emphasized in the model designs for beauty shops which the Armstrong Cork Company is offering to the beauty shop industry. Outstanding features are discussed in detail in an "ideas" portfolio which Armstrong is distributing throughout the beautician industry.

The "model" beauty shop is a feature in Armstrong's promotion campaign for business floors.

The beauty shop design includes concealed lighting to prevent shadows and glare, to flatter complexions and soften facial contours; and daylight spotlights in the service booths to eliminate shadows and to help prevent coloring mistakes by the operators.

No expert on beauty needs to be told that indirect lighting is more flattering than direct lighting. As a simple way to obtain shadow-free, indirect illumination at low cost, it is suggested in the portfolio that a circular piece of light weight wall board be suspended under a large circular light in the center of the establishment, and that the suspension be adjusted to give the best light distribution. It is further suggested that this circular light shield be painted to harmonize with the rest of the shop, thus adding a modern decorative touch.

For additional illumination, tubular light units concealed behind the circular facing of the dropped ceiling of the service booths are recommended. The result is a soft light that shows the shop off to the best advantage and is flattering to patrons.



CONCEALED LIGHTING eliminates shadows and glare, flatters complexion, and softens facial contours in this model beauty shop design. Daylight spotlights are used in the service booths to eliminate shadows and help prevent coloring mistakes by the operators; tubular light units are concealed behind the circular facing of the dropped ceiling of the service booths.

Curtis StarLux is a four-lamp pendant luminaire which is far ahead in beauty and effectiveness. Engineered-design and quality manufacture combine to guarantee many years of efficient trouble-free service. Scientific shielding and low surface brightness insure eye comfort. The maintenance man will like this fixture too—the glass panels can easily be removed for cleaning when necessary, but lamps and starters can be replaced without removing any glass.

The Curtis

STARLUX

CURTIS *Lighting*, INC.

6135 WEST 65TH STREET, CHICAGO 38, ILLINOIS

Adequate light-on-the-work is vital . . . to workers' comfort and high production. "Proportional Lighting"—the proper ratio between general and close-to-the-job lighting—insures it. Westinghouse Focalaire lighting units combined with good general illumination provide production-boosting "Proportional Lighting". Focalaire units are economical—efficient—easily adapted to machines, benches and tables, and extremely simple to install. J-04014

WORK RIGHT WITH
Proportional Light
safe . . . sure . . . efficient

Get more light on this subject . . . see page 23

Westinghouse
PLANTS IN 25 CITIES OFFICES EVERYWHERE

Lighting Equipment

Daylight spotlights, flush with the ceiling in every service booth, are suggested also because they cast a true white light that eliminates shadows . . . a welcome aid to beauty operators in obtaining precise tints, hair shades, and complexion colorings.

The portfolio also recommends that beauty shop remodeling plans include provisions for installing simplified air-conditioning and deodorizing systems when this equipment is again available.

COST ANALYSES FOR LIGHTING SYSTEMS

When the gates are finally opened to the vast postwar lighting market, undoubtedly there will be huge demands for estimates on revamped lighting installations—particularly in the commercial field (stores, office and public buildings) which has been stymied by wartime restrictions on materials and equipment. Engineers, contractors and architects are going to be called in to recommend a lighting system—and cost is going to enter very definitely into the picture.

With the various light sources and systems now available, and with developments that are bound to come in this field, the customer is going to be slightly befuddled. Just what type of lighting should he buy—which will do the best job—how much will each type cost? He will want to know the answers to those questions before he makes his decision and buys an installation. And it is you—the engineer, contractor or architect—who is going to have to be prepared to give him the right answers. Satisfactory solutions to the specific lighting problem must be forthcoming—then these solutions must be properly evaluated on an economic basis.

A discussion of the subject of lighting costs in the Westinghouse Lighting Handbook breaks the necessary calculations down into two specific groups of essential factors. They are:

I. FIXED CHARGES—

a. *Wiring Cost*—a portion of the initial expenditure is to be written off each year. Generally accepted percentages for various types of installations are as follows:

(1) *Commercial Installations*—15 percent of the initial investment.

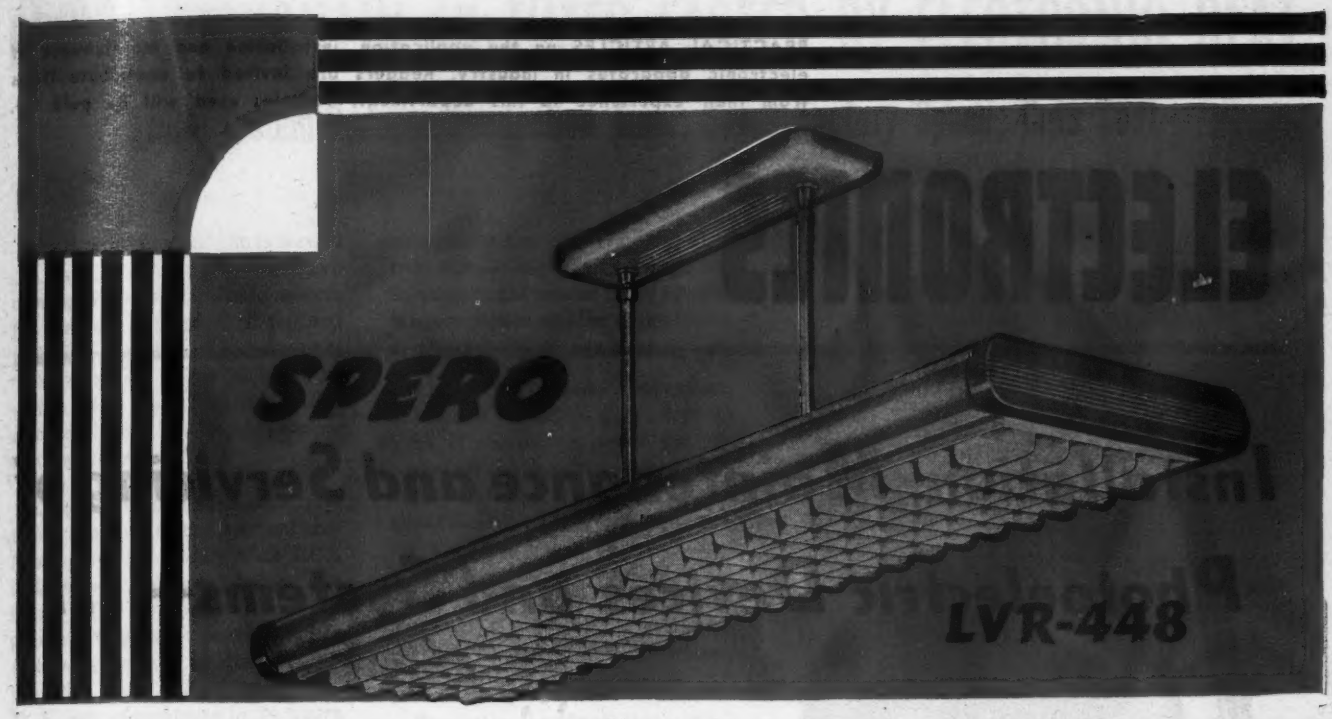
[Continued on page 197]

COMPARATIVE COST ANALYSIS OF FLUORESCENT AND INCANDESCENT LIGHTING INSTALLATION

Specifications	Fluorescent	Incandescent
MACHINE SHOP		
a. Type of fixture	RLM	RLM
b. Number of fixtures	146	64
c. Fixture Wattage	100 (incl. Aux.)	500
d. Maintained ft.c.	40	40
e. Annual Operating hours*	5000	5000
FIXED CHARGES		
1. Cost of fixtures*	$ 2700	$ 255
2. Wiring cost	730	320
3. Complete installation cost (1, 2)	3430	575
A. Fixed annual charge on investment in equipment, (interest, taxes, insurance, amortization, 17%)	$ 584	$ 98
OPERATING CHARGES		
1. Lamp Cost		
a. Total number of lamps	292	64
b. Lamp Life (hours)	2500	1000
c. No. of lamp renewals $\frac{a \times \text{operating hours}}{\text{lamp life}}$	585	320
d. Lamp cost (list less discount of 30%)	$ .67	$ .84
B. Total annual lamp cost (c x d)	$ 392	$ 269
2. Energy cost		
a. Total watts	14,600	32,000
b. Annual Kwh.	73,000	160,000
C. Total annual energy cost at 1½¢ per Kwh.*	$ 1095	$ 2400
D. Maintenance Cost**	90	25
TOTAL ANNUAL OPERATING COST (Sum of A, B, C and D)	$ 2161	$ 2792

*Note: Items marked with an asterisk (*) have an important bearing on the final result. Determine these factors carefully!

** This cost is mainly wages for labor and will vary widely with the locality and type of lighting installation. It should always be included in cost comparisons when known.



MASTERPIECE of Fluorescent Engineering

The ideal commercial fixture . . combining highest efficiency, modern design, minimum glare and low maintenance costs

All the elements of correct design have been incorporated in this outstanding fixture. The light from the four 40W tubes is shielded by evenly-spaced egg-crate louvres, minimizing glare. Reflecting surfaces, finished in "Plastox" white (88% reflection factor) are so arranged as to eliminate "trapped light" — resulting in high intensity with low surface brightness. Plastic side panels shield end tubes and contribute to the smart streamlined appearance of this modern unit.

Made for stem or flush mounting. For stem mounting unit is equipped with an attractive ceiling canopy. Louvres are hinged for easy maintenance. Available with Spero Insta-lite — providing instantaneous lighting and still further reducing maintenance costs by eliminating starting switches.

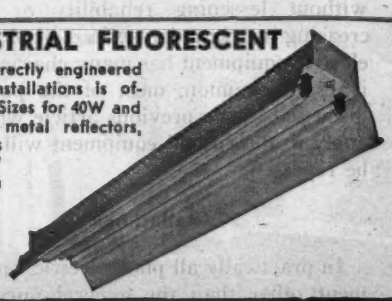
NOTE TO WHOLESALERS: Now is the time to become the distributor for this exceptional unit, the Spero LVR-448. Write for details.

THE SPERO PLANT STANDS BEHIND THE ELECTRICAL WHOLESALER

In spite of shortages and restrictions, Spero has continued to make and supply customers its regular line as far as possible. Spero products are sold only through legitimate electrical wholesalers.

SPERO INDUSTRIAL FLUORESCENT

A complete line of correctly engineered fixtures for Industrial installations is offered in the Spero line. Sizes for 40W and 100W tubes. All have metal reflectors, with reflecting surfaces finished in "Plastox" white. Available with Insta-lite.



THE SPERO ELECTRIC CORPORATION

18222 LANKEN AVE. ★ CLEVELAND, OHIO

PRACTICAL ARTICLES on the application, installation and maintenance of electronic apparatus in industry. Readers are invited to contribute items from their experience to this department. Articles used will be paid for.

ELECTRONICS

Installation, Maintenance and Servicing of Photoelectric Devices and Systems—III

By E. B. McDowell
Electronic Control Section
Industrial Control Engineering Div.
General Electric Company

IN addition to the familiar relays discussed in a previous article, there is a wide variety of photoelectric devices and systems designed to perform special functions. The electronic units used in these applications range from simple devices performing some special signaling, controlling, or measuring function to quite complicated equipment which is an integral part of some electrical-mechanical system. The photoelectric pyrometer, outdoor light control, cutoff register control. side register control, pin-hole detector, smoke detector, flame detector, contour follower, and weft straightener are typical examples.

Because there are few moving parts in electronic equipment, the problem of maintenance is never very trying. When properly installed and maintained, this equipment will give years of satisfactory service, and compared with other electrical equipment, greater precision and sensitivity is usually obtained with the electronic devices, without lessening reliability or increasing maintenance. Since all photoelectric equipment has many characteristics in common, most of the points discussed in the previous article which apply to the special equipment will not be repeated.

Installation

In practically all photoelectric equipment other than the general purpose relay, the phototube is located separate from the master control panel. The phototube may be mounted in a holder either alone or with an auxiliary amplifier, or both the holder and a light source may be mounted together on a common support, in which case the unit is called a scanning head.

Phototube holders and scanning heads should be mounted rigidly with the lens or phototube facing downward whenever possible. Mounting in this position not only minimizes the collection of dust on the glass surfaces, but also reduces the effect of extraneous light. The unit should be suitably protected if, because of its location, it is likely to be damaged or thrown out of adjustment by mobile shop equipment (see Fig. 2).

All cable to the phototube must be shielded, with the shield connected to the phototube holder and to the correct point on the control panel. The cable should not be located where it is exposed to water or excessive moisture.

Where a definite length of cable is included with a phototube holder or a scanning head, no appreciable extension should be made unless the instructions with the equipment specify that an extension is permissible.

The installation and conditions of operation for photoelectric relays des-

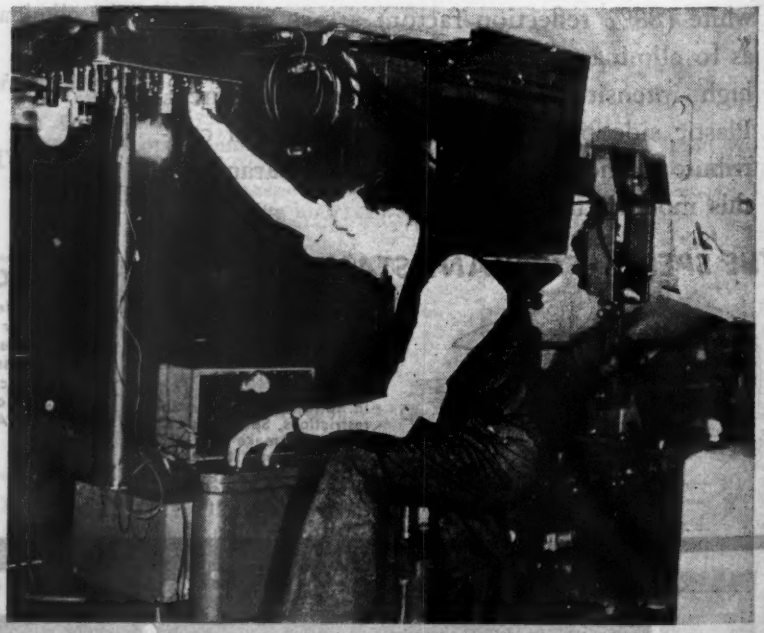


FIG. 1—Checking the operation of a photoelectric mult-color register control by means of a cathode ray oscilloscope—a very useful instrument for adjusting and servicing electronic equipment.

DRYING PENICILLIN 48 TIMES FASTER BY ELECTRONIC HEAT

RCA System Reduces Production Time; Saves Factory Space; Cuts Cost

At a time when penicillin is needed fast, RCA engineers have developed a new electronic system for the bulk reduction of purified penicillin solution. Conventional "freeze drying" takes 24 hours to perform this step; the new RCA method does it in 30 minutes—48 times faster!

E. R. Squibb and Sons, manufacturing chemists to the medical profession, worked closely with RCA in developing the new process. The initial RCA 2000-watt electronic generator and associated equipment (shown at right) at the Squibb penicillin plant, New Brunswick, N. J., can concentrate in 24 hours enough penicillin solution to treat 4,000 patients requiring 500,000 Oxford units each.

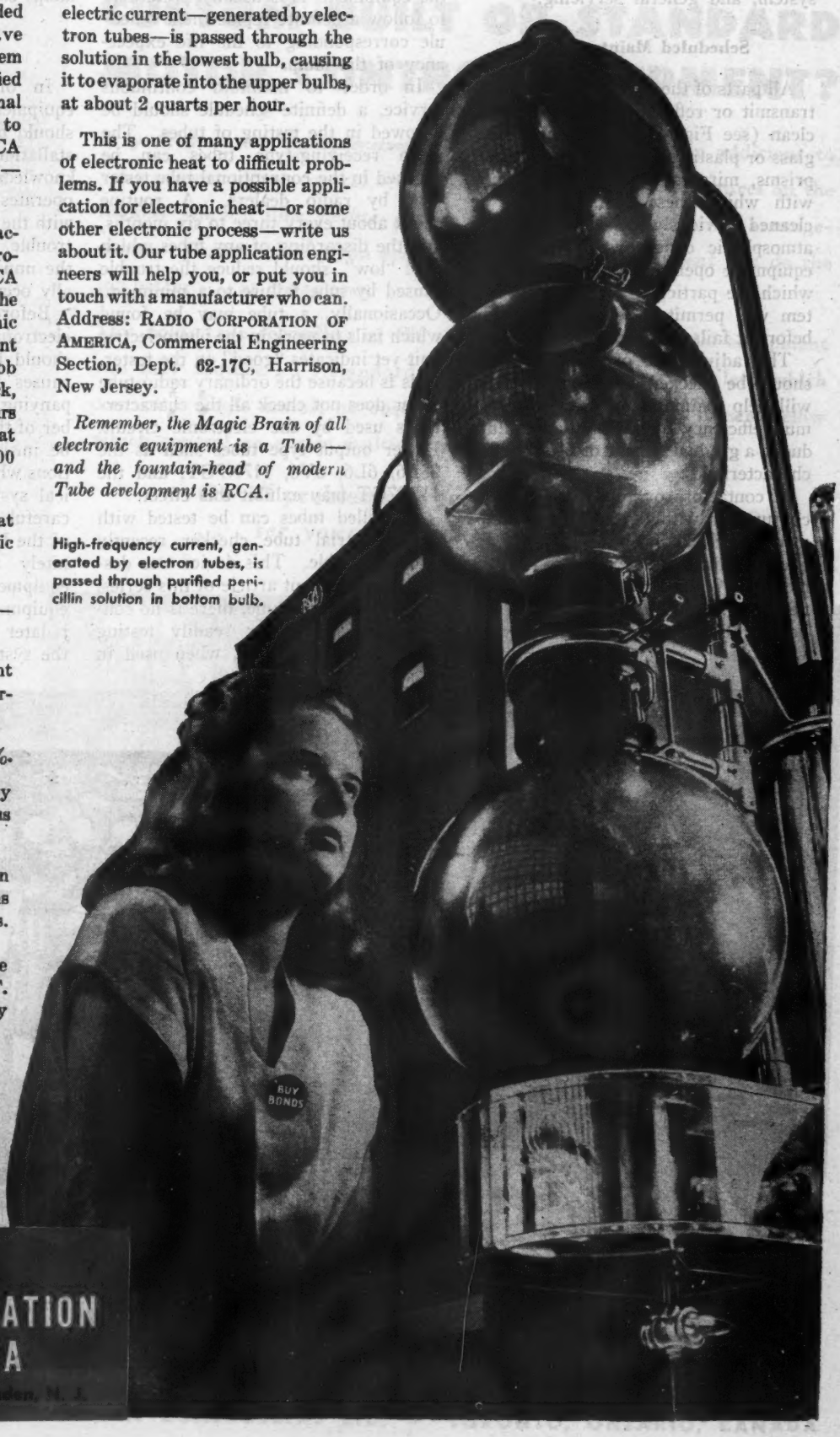
Squibb scientists disclosed that additional advantages of electronic heat include:

1. Savings of one ton of dry ice—$65—per day.
2. Large savings in initial plant investment compared with former process.
3. Reduction of floor space by 90%.
4. Reduction of maintenance by eliminating freezing apparatus and high-vacuum pumps.
5. Smoother flow of production with less chance of shut-downs due to mechanical difficulties.

Electronic heat is used to "boil" the purified penicillin solution at 50° F. at low pressure. High-frequency electric current—generated by electron tubes—is passed through the solution in the lowest bulb, causing it to evaporate into the upper bulbs, at about 2 quarts per hour.

This is one of many applications of electronic heat to difficult problems. If you have a possible application for electronic heat—or some other electronic process—write us about it. Our tube application engineers will help you, or put you in touch with a manufacturer who can. Address: RADIO CORPORATION OF AMERICA, Commercial Engineering Section, Dept. 62-17C, Harrison, New Jersey.

Remember, the Magic Brain of all electronic equipment is a Tube—and the fountain-head of modern Tube development is RCA.



High-frequency current, generated by electron tubes, is passed through purified penicillin solution in bottom bulb.

RCA

RADIO CORPORATION OF AMERICA

RCA Victor Division • Camden, N. J.

cribed in the previous article also apply in most cases to the control panel, light sources, and auxiliary units of the special equipment. These devices should be installed so that they are easily accessible for changing lamps and tubes, adjustment of the optical system, and general servicing.

Scheduled Maintenance

All parts of the optical system which transmit or reflect light must be kept clean (see Fig. 4). This includes all glass or plastic surfaces such as lenses, prisms, mirrors, etc. The frequency with which these parts have to be cleaned obviously depends upon the atmospheric conditions in which the equipment operates, and the extent to which the particular photoelectric system will permit a reduction of light before it fails to operate.

The adjustment of the equipment should be checked occasionally. This will help maintain operation at maximum efficiency and forestall any failure due to a gradual change of light or tube characteristics.

If contactors or relays are used in conjunction with the electronic equipment they should be inspected frequently, and suitable repairs, adjustments, or replacements made whenever necessary. Quite often these magnetic devices are subjected to very heavy use when used with electronic systems, with the result that millions of operations may be put on them in a short time.

The light source lamp will have to be replaced about every 1000 to 3000 hours. Rather than wait until a lamp burns out and causes a shutdown of the equipment, it is usually preferable to follow a definite replacement schedule corresponding to the life expectancy of the lamp.

In order to maintain continuous service, a definite schedule should be followed in the testing of tubes. The radio receiving-type tubes can be checked in the conventional tube tester used by radio dealers. A routine check about every three to six months, and the discarding of any tubes which read "low", should reduce the trouble caused by tube failure to a minimum. Occasionally, a tube may be found which fails to work in the photoelectric unit yet indicates "good" on the tester. This is because the ordinary radio-tube tester does not check all the characteristics used by the electronic circuit. Power output type tubes such as the 25L6, 6L6, 6V6, 117N7GT, and the 117P7GT may exhibit this effect.

Gas-filled tubes can be tested with the industrial tube checker recently made available. This device was described in a recent article of this series.

At the present time, there is no conventional means for readily testing phototubes. However, when used in proper circuits and not abused by excessive light or high temperature, these tubes have a life expectancy of more than a year and quite commonly last two or three years.

It is recommended that at least one complete set of spare tubes and several lamps should always be kept on hand.

Servicing

In order to service photoelectric equipment efficiently, the service man should be familiar with the entire installation and have at least a general knowledge of how the electronic control operates. He should also be acquainted with the procedure to follow in locating trouble, and be able to analyze quickly the unusual problems which occasionally occur.

Before attempting to work on the electronic circuit, a careful analysis should be made of all other possible causes for the failure. The accompanying service schedule lists a number of the common faults which should be initially investigated. In installations where the electronic and mechanical systems are closely associated, a careful investigation should be made of the latter before the trouble is definitely attributed to the electronic equipment. Frequently the electronic equipment is blamed for trouble which is later found at some other location in the system.

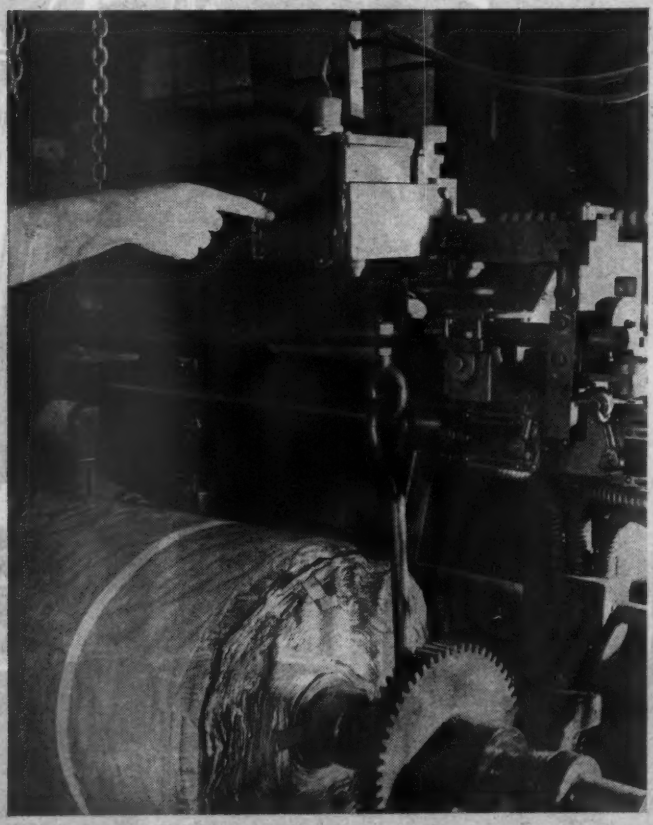
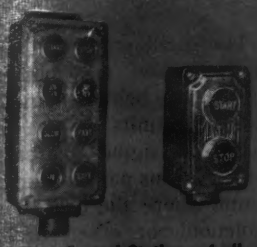
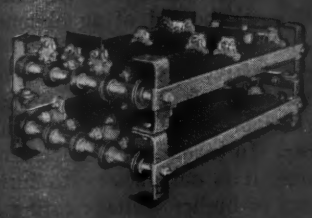


FIG. 2 Photoelectric scanning heads exposed to damage from mobile shop equipment should be suitably protected, as shown.

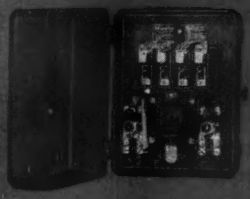
FIG. 3 Measuring a voltage on a cutoff register control by means of a vacuum tube voltmeter — a useful instrument for servicing.



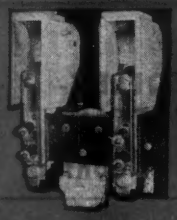
Push Button Control Stations of all types in General Purpose, Watertight and Weatherproof enclosures.



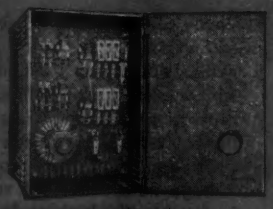
Resistors — Edgewound, Haxwound and Smoothwound types.



A.C. and D.C. Motor Starters . . . across the line, reversing, and non-reversing, and in combination units.



Contactors for A.C. and D.C.



Manual Speed Regulators and Field Rheostats.

Heavy-duty, weatherproof control stations built to prevent accidental starting or stopping by operator.

Which Will You Need..

CUSTOM-BUILT OR STANDARD MOTOR CONTROL EQUIPMENT?

If your post-war reconversion plans **call for alterations or additions to your present motor control set-up, be sure to get facts and figures on the famous Monitor line before proceeding with final installation arrangements. That's because you may find that Monitor equipment can do the job better . . . at lower cost.**

This holds true regardless of the size and type motor control equipment you may require . . . standard units of the type shown at left which control a single motor, or custom-built units of the type shown below which control an entire multiple motor operation.

On *all* problems of post-war motor control
. . . see your Monitor field engineer first!

This custom-built unit controls 14 blower motors, 9 hoist motors, 7 pump motors, and four 20 H.P. motors in a large quadruple drive printing press.

The Monitor Controller Company

GAY, LOMBARD & FREDERICK STS. BALTIMORE-2, MARYLAND

CANADIAN AFFILIATE • CANADIAN CONTROLLERS LTD. • TORONTO, ONTARIO, CANADA

After all sources of trouble external to the electronic circuit have been thoroughly investigated, then trouble-shooting on the circuit should begin. A visual inspection should be made first in order to locate any broken leads or defective parts, such as overheated resistors, transformers, or capacitors. Defective resistors can often be detected by their severe discoloration, transformers by the presence of impregnating compound coming out of the windings, and capacitors by the presence of wax or liquid on the outside of the container. When a defective circuit element is discovered in this manner, a further analysis should be made to determine if this failure was caused by the failure of another part of the circuit. For instance, a short-circuited capacitor or potentiometer could cause overheating and probably damage to a resistor or transformer with which it is associated. Each circuit failure presents a different problem and therefore must be analyzed separately.

If a visual inspection does not provide a solution to the trouble, then the next step is to measure the circuit voltages and compare them with those listed in the instructions for the equipment. The d-c output voltage of the rectifier used in most circuits should be measured first. Then measurements should be made of the voltages at the various points on the voltage divider and all other places in the circuit where the potentials are known.

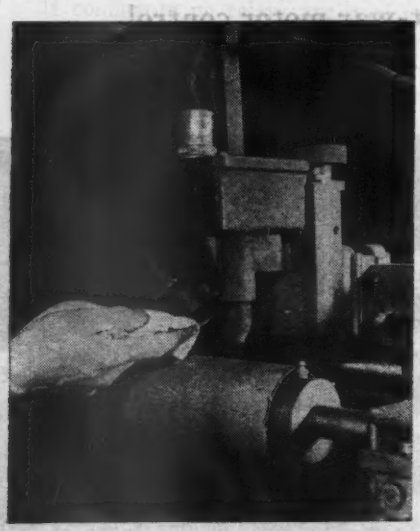


FIG. 4 Lenses and other glass and plastic parts of photoelectric scanning heads should be regularly wiped off with a clean, soft cloth in order to assure efficient operation.

For measuring these voltages, a high-resistance voltmeter having a resistance of at least 5000 to 20,000 ohms per volt should always be used. In some cases, it is necessary to use a vacuum tube voltmeter having an internal resistance of 10 to 15 megohms (see Fig. 3). The type of voltmeter used depends entirely upon the value of resistance across which the measurement is to be taken. To provide accurate readings the voltmeter resistance should be at least 10, and preferably 20 times the resistance of the resistor across which the instrument is placed. For example, to measure the voltage across a 100,000-ohm resistor, the total resistance of the voltmeter should be at least 1 million ohms.

If the person servicing the equipment is acquainted with the operation of the electronic circuit, a cathode ray oscilloscope is one of the best instruments to use for quickly locating trouble (see Fig. 1). As explained in a preceding article on the cathode ray oscilloscope, it was pointed out that its greatest value to the trouble-shooter lies in the fact that it enables him to actually see the instantaneous behaviors and relationships of the various voltages throughout the many circuits and circuit elements. Photoelectric systems usually consist of a master control panel into which are fed the signals from auxiliary equipment such as a scanning head and rotary selector switch. The oscilloscope will provide a visual indication of whether the proper signals are being obtained from these auxiliary units. Then in the master panel the signals can be traced through the various parts of the circuit to the point where the control of the motor, solenoid, or other mechanical device takes place. When the trouble has been traced to a definite portion of the circuit, the defective part can be located with the aid of an ohmmeter and voltmeter.

The defective circuit element should be replaced with one of equal rating and preferably made by the same manufacturer. In case a substitution has to be made, it is satisfactory to furnish resistors of higher wattage rating and capacitors of higher voltage rating, but their respective resistance and capacity values must be the same as the one being replaced. If the proper value of resistance or capacity is not available, the correct value may be obtained by connecting several units in series or parallel. When replacement electrolytic capacitors are wired into the circuit, the polarity must be observed.

SERVICE CHART FOR PHOTOELECTRIC DEVICES AND SYSTEMS

General:—Applies to all types of control

TROUBLE	CAUSE	REMEDY
A. Photoelectric system is completely inoperative. (initial installation).	1. Incorrect wiring.	1. Check all connections and correct any errors.
	2. Incorrect adjustment.	2. Adjust equipment in accordance with manufacturer's instructions.
	3. Line voltage is not within specified limits.	3. Provide proper line voltage to the equipment. If voltage varies over wide limits, use a constant voltage transformer. If voltage is consistently high or low, an auto-transformer can be used to correct voltage.
	4. Fuses blown.	4. Be sure to check all connections before replacing fuses. Do not use fuses larger than necessary to protect the equipment.
	5. Damaged relays or contactors. Contact tips may have been burned or welded due to improper connections. Relay or contactor may have been damaged during transportation or installation.	5. Repair or replace relay or contactor.
	6. Lamp in light source not lighted.	6. (a) Replace lamp if burned out (b) Investigate the connections to the light source and its transformer, and repair if necessary.

[Continued on page 134]

WONDERING HOW TO BEAT FUEL SHORTAGES?

Your Westinghouse distributor offers two important aids in meeting fuel shortage problems.

First: A complete line of Westinghouse Electric Heating Units for every type of industrial requirement.

Second: The distributor's own "how-to-do-it" ability, combining knowledge drawn from Westinghouse heating headquarters, with his own wide practical experience in industrial heating applications.

Fan-type heaters solve many out-of-the-way space-heating problems in offices, plants and warehouses. In summer they operate as fans. Strip-type heaters solve limitless special problems in applying heat to vats, tanks, process machinery, hot tables, ovens and similar uses; cartridge heaters and immersion heaters meet other solid and liquid heating requirements.

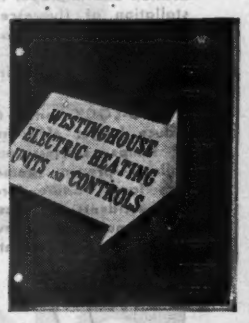
For any application, your Westinghouse distributor can offer you prompt help . . . competent recommendations. Call on him.

J-90513

USE THIS BOOK:::

for quick help in selecting . . . ordering . . . applying heating units

More than 40 pages of useful ordering and application information are contained in this handy catalog of Westinghouse Electric Heating Units and Controls (Catalog 28-000). Products listed include strip heaters, finned heaters, cartridge heaters, immersion heaters, air and oven heaters, thermostats and special controls. Ask your Westinghouse distributor for your copy, or write Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.



Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

SEE YOUR WESTINGHOUSE DISTRIBUTOR *FIRST!*

Protect the safety of your customers and their machinery with these easy to install, economical locks for fluorescent lamps.

Flur-o-Locks

Tends to Increased Efficiency of Lamps Starters and Ballasts

DISTRIBUTORS—Write the little watchman for samples and folders for distribution to your customers.

FLUR-O-LOCKS are as easy to install as this illustration describes and are at present being recommended by General Electric, Westinghouse, Graybar Electric Supply Houses and other distributors as a protection from major difficulties incident to vibration and improper installation of fluorescent lamps. FLUR-O-LOCKS are standard equipment in more than 5,000 leading industrials.

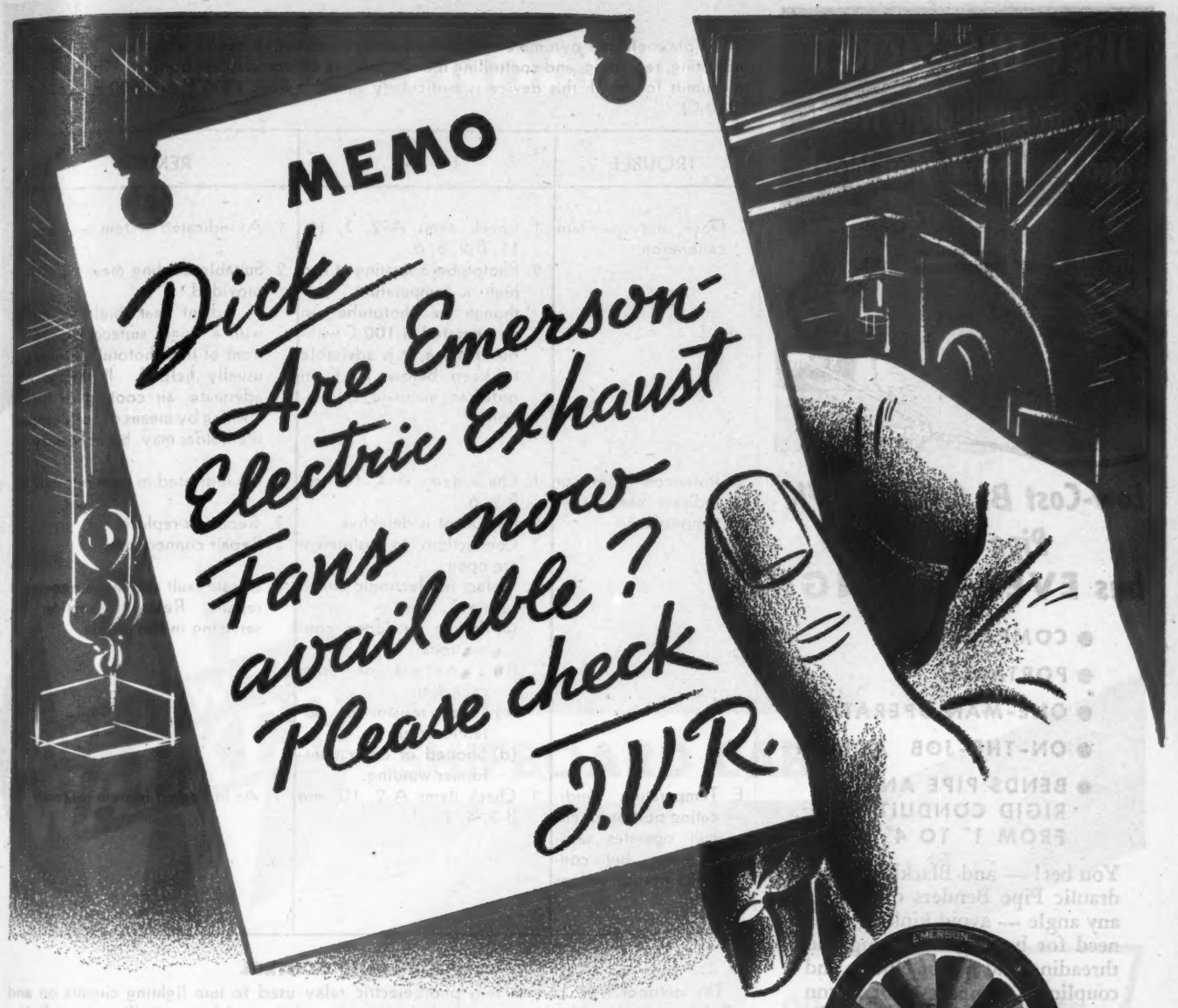
FLUR-O-LOCK tends to induce longer efficiency of lamps, starters and ballasts—prevent premature lamp failure—forestall accidents and possible damage suits—save costly lamp replacements.

Illustration of two fiber parts of FLUR-O-LOCKS—perforated disc and key—as applied to lamp and adjusted for locking.

Flur-o-Locks by LADUBY COMPANY

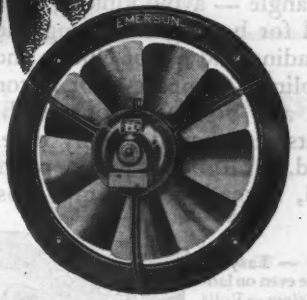
TROUBLE	CAUSE	REMEDY
A. Photoelectric system is completely inoperative. (initial installation) [Con't.]	7. Too low a voltage on lamp. Voltage as measured at lamp (not at transformer) should be within the limits specified by the manufacturer. Usually this is between 4.5 and 5.2 volts.	7. Use larger size wire to light source if excessive voltage drop is occurring between transformer and light source.
	8. Light source not properly focused and aligned with respect to the phototube unit.	8. Make necessary adjustments.
	9. Tubes placed in wrong sockets.	9. Locate tubes in accordance with socket markings.
	10. Defective tubes.	10. Test tubes and replace defective ones. If tester is not available, replace tubes one at a time with a spare.
	11. Light other than that from the source may be reaching the phototube. This may be daylight, light from room fixtures, or reflected light from mirrors or polished surfaces.	11. (a) Remove interfering light or provide suitable shades. (b) Relocate phototube unit.
	12. Timing relay for gas-filled tubes may not have timed out.	12. Wait for completion of time interval.
	13. Damaged equipment due to improper handling during shipment or installation.	13. Inspect circuits for broken connections or damaged parts and repair or replace if necessary.
B. Photoelectric system does not operate. Has been functioning satisfactorily but suddenly failed.	1. Check items A-2, 3, 4, 6, 7, 8, 10, 11, 12 for possible cause of trouble.	1. As indicated in items referred to.
	2. Too low insulation resistance in phototube circuit caused by dirt or moisture. This includes the socket, cable, and connections.	2. Clean or replace cable, sockets, or other defective parts. The insulation resistance between all high impedance points and ground, with phototube removed and cable disconnected from panel should be 500 megohms or more.
	3. Contacts or relay or contactor may have welded, or they may have reached the end of their operating life.	3. Replace contacts, or entire relay or contactor. If contacts weld frequently, the current inrush to the load is too great. Either the load must be reduced or an auxiliary contactor installed.
	4. Broken or loose connections between electronic panel and auxiliary control.	4. Repair faulty connections.
	5. Vibration or loose mounting has caused misalignment of light source, phototube unit, or light reflecting surfaces.	5. Place equipment in proper alignment.
	6. Excessive accumulation of dirt, oil film, or other foreign matter on the lens or other surfaces which transmit or reflect light.	6. Clean the surfaces and inspect at regular intervals.
	7. Defect in the electronic circuit such as (a) Broken or loose connections. (b) Shorted or open capacitor. (c) Open resistors or potentiometers. (d) Shorted or open transformer winding. (e) Shorted or open relay or contactor coil.	7. Locate fault and make necessary repairs. Refer to section on servicing in this article.

[Continued on page 136]

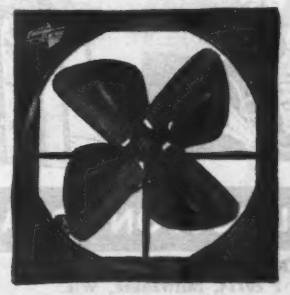


If you've long planned to remedy that bad-air condition, but pigeon-holed the project temporarily because of war-time restrictions, investigate now! The day when you can install Emerson-Electric Exhaust Fans may be nearer than you think.

Production of these precision-built, powerful air movers is already under way. Their efficiency and dependability reflect Emerson-Electric's 54 years of fan manufacturing skill augmented by new experience gained in the building of highly technical equipment and motors for combat aircraft.



Emerson-Electric direct-drive and belt-drive Exhaust Fans are produced in sizes from 12 to 48 inches delivering up to 21,100 cubic feet of air per minute.



Write for Bulletins X4559 and X4566 to obtain full information on all types of Emerson-Electric Exhaust Fans.

THE EMERSON ELECTRIC MFG. CO., ST. LOUIS 3, MO.

Branches: New York • Chicago • Detroit • Los Angeles • Davenport

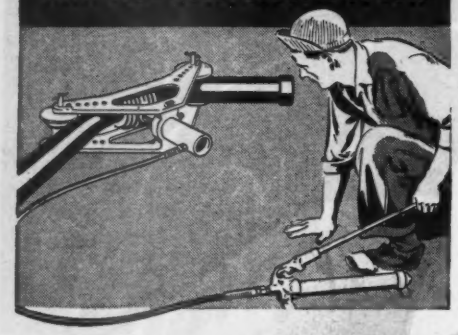
409

EMERSON ELECTRIC

MOTORS · FANS APPLIANCES

JUST THE "TICKET"

for Your Immediate Needs and Re-Conversion Work

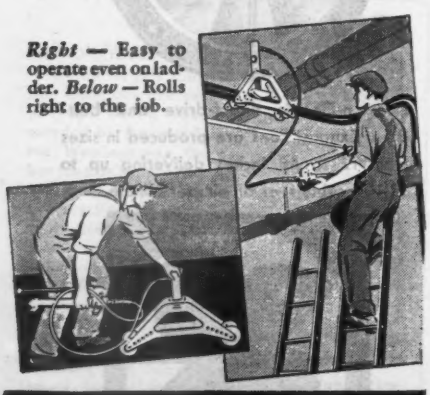


Low-Cost BLACKHAWK Pipe Bender has EVERYTHING!

- COMPACT
- PORTABLE
- ONE-MAN OPERATION
- ON-THE-JOB ACTION
- BENDS PIPE AND RIGID CONDUIT FROM 1" TO 4"

You bet! — and Blackhawk Hydraulic Pipe Benders operate at any angle — avoid kinking, save need for heating or cutting and threading and use of elbows and couplings. Compact 10 or 20-ton ram and big range of attachments also handle many other bend, straighten, press, push, pull, spread and clamp jobs.

Right — Easy to operate even on ladder. *Below* — Rolls right to the job.



MAIL COUPON TODAY

BLACKHAWK MFG. COMPANY
Dept. P 20114, Milwaukee, Wis.

Send full information about your Pipe Benders.

Name.....

Company.....

Address.....

PHOTOELECTRIC PYROMETER

The photoelectric pyrometer is a radiant-energy responsive device which can be used for indicating, recording, and controlling the temperature of incandescent bodies. The temperature limits for which this device is particularly suited is from 1400 F to 3600 F (760C to 1980 C).

TROUBLE	CAUSE	REMEDY
C. Does not maintain calibration.	1. Check items A-2, 3, 10, 11, B-2, 5, 6. 2. Phototube operating at too high a temperature. Although the phototube can be operated at 100 C without damage, it is advisable to keep below 70 C in order to maintain calibration.	1. As indicated in item referred to. 2. Suitable cooling means must be provided. A radiant heat shield of metal with a bright surface placed in front of the phototube holder is usually helpful. If this is not adequate, air cooling or liquid cooling by means of coils around the holder may be necessary.
D. Instrument does not indicate changes in temperature.	1. Check items A-4, 10, and B-2, 6. 2. Instrument is defective. 3. Connections to instrument are open. 4. Defect in electronic circuit such as (a) Broken or loose connections. (b) Shorted or open capacitor. (c) Open resistor or potentiometer. (d) Shorted or open transformer winding.	1. As indicated in item referred to. 2. Repair or replace. 3. Repair connections. 4. Locate fault and make necessary repairs. Refer to section on servicing in this article.
E. Temperature indicating portion of circuit operates satisfactorily, but control portion does not.	1. Check items A-2, 10, and B-3, 4, 7.	1. As indicated in item referred to.

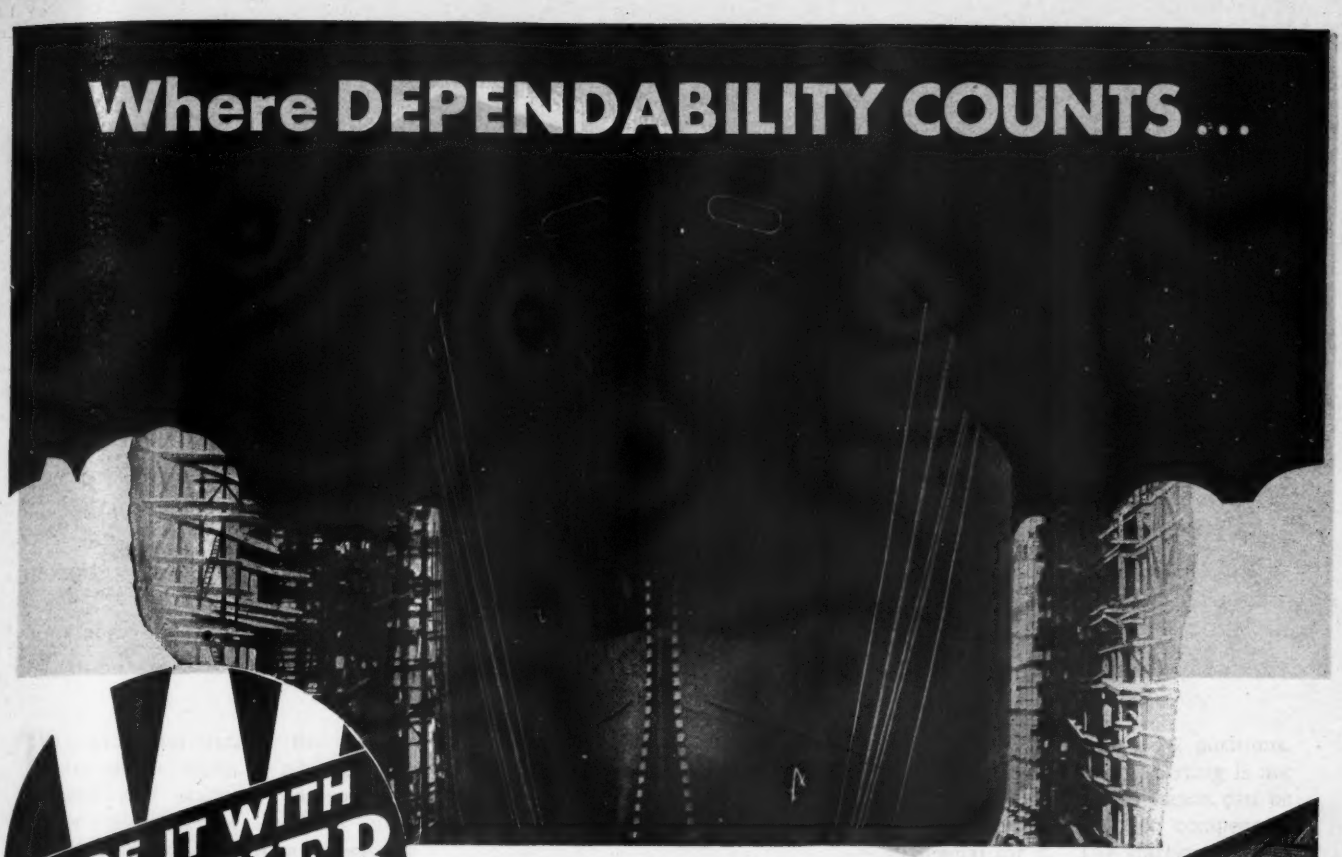
OUTDOOR LIGHT CONTROL

The outdoor light control is a photoelectric relay used to turn lighting circuits on and off automatically with changes in daylight intensity. It is used for controlling street lights, sign and billboard lights, and radio tower warning lights.

TROUBLE	CAUSE	REMEDY
F. Unit does not respond to changes in daylight intensity.	1. Check items A-3, 4, 10 and B-2, 3, 4. 2. Tubes or relay may have been damaged by lightning. 3. Defect in electronic circuit such as (a) Broken or loose connections. (b) Shorted or open capacitor. (c) Open resistor or potentiometer. (d) Shorted or open relay coil.	1. As indicated in item referred to. 2. Replace tube and repair or replace relay. 3. Locate fault and make necessary repairs. Refer to section on servicing in this article.
G. Illumination level adjustment has to be changed frequently to maintain operation at the proper light level.	1. Defective amplifier tube.	1. Replace tube.
H. Light level at which relay operates varies appreciably from day to day.	1. Improper location of light control.	1. Control should be located so that rays of sun never shine on phototube. Control should face north where north of equator.

[Continued on page 1981

Where DEPENDABILITY COUNTS...



WIRE IT WITH WALKER

SHIPBOARD CABLES

Leaded or Non-Leaded
Synthetic or Varnished Cambric Insulation
In accordance with Specification AIEE-45A and USMC Design Memo #46

Ask your local Distributor for prices and deliveries that you can rely upon.
WALKER BROS., Conshohocken, Pa.

Other Quality Products by walker of Conshohocken

"Preset-Inserts" Underfloor Distribution Systems
"Dualcote" Rigid Steel Conduit
Electric Metallic Tubing
Rubber-covered, Synthetic and Leaded Wires and Cables
"Walkerflex" Non-Metallic Sheathed Cables
Service Entrance Cables
Automotive Wires and Cables

Symbol of Lighting Progress

12 NEW SPECIFICATIONS FOR INDUSTRIAL LIGHTING

RLM Specification No. 1—
Dome Reflector

RLM Specification No. 2—
Deep Bowl Reflector

RLM Specification No. 3—
Symmetrical Angle Reflector

RLM Specification No. 5—
48" Fluorescent Two-Lamp Closed-End Porcelain Enamel Unit

RLM Specification No. 6—
48" Fluorescent Three-Lamp Closed-End Porcelain Enamel Unit

RLM Specification No. 7—
60" Fluorescent Two-Lamp Closed-End Porcelain Enamel Unit

RLM Specification No. 8—
60" Fluorescent Two-Lamp Closed-End Porcelain Enamel Diffuser Unit

RLM Specification No. 9—
48" Fluorescent Two-Lamp Open-End Porcelain Enamel Unit

RLM Specification No. 10—
48" Fluorescent Three-Lamp Open-End Porcelain Enamel Unit

RLM Specification No. 11—
60" Fluorescent Two-Lamp Open-End Porcelain Enamel Unit

RLM Specification No. 12—
60" Fluorescent Two-Lamp Open-End Porcelain Enamel Diffuser Unit

★RLM Specification No. 18—
Glassteel Diffuser

★New RLM Approved Unit

● For 25 years, manufacturers of RLM lighting units have worked together to give significance to their label. Much of this work was pioneering in fields of new design . . . its success is demonstrated by wide acceptance of lighting fixtures bearing the RLM label. The buyer now looks on this label as a symbol of lighting progress—one that symbolizes carefully engineered industrial fixtures.

The buyer of fixtures bearing the RLM label knows that he is getting:

- ★ **Engineered Lighting**
- ★ **Economy through More Light at No Extra Cost**
- ★ **Low Maintenance Costs and Long Life**

RLM progress in the past year is demonstrated by the table of new and revised specifications listed at the left. These specifications, representing months of careful engineering study, research and tests, establish new, higher standards for RLM industrial fixtures. Copies may be secured from RLM manufacturers, or direct from the RLM Standards Institute.

Write for Your Copies Today!

RLM STANDARDS INSTITUTE
INCORPORATED

INDUSTRIAL ELECTRIFICATION

ENGINEERING • INSTALLATION • MAINTENANCE

Controllers for Wound-Rotor Motors—II

Connection diagrams of the various types of controllers and fundamentals of their operation are explained in this article on the selection and application of wound-rotor motor controllers.

By P. B. Harwood,
Manager of Engineering
Cutler-Hammer, Inc.
Milwaukee, Wisconsin

THE characteristics of the wound-rotor motor make it adaptable to speed and starting control. A number of different methods may be used to exploit these characteristics to the greatest advantage.

Face-plate Starters

Figure 1 below shows the wiring diagram of a manually-operated face-plate type starter. The starter has an operating lever provided with contact brushes on both ends. Two sets of copper segments are mounted on the starter base. The resistor material, which is in the form of wire wound resistor tubes or of cast-iron grids, is mounted in the starter enclosure, and is connected to the copper segments. The resistor is made up of three sections connected in delta, but is commutated in two phases only, the third being a fixed step. This arrangement is used because it permits the use of a simple operating lever. The resistor is balanced in all three phases at the start, and also in the final running position, and is unbalanced in the intermediate positions. The unbalancing during starting is not detrimental, and the resistance can be proportioned so as to compensate somewhat for it. The starting lever is provided with a spring to return it to the all-resistance-in position when it is released. It is held in the running position by a small electro-magnet, the coil of which is connected across two of the power lines, behind the stator contactor. The lever cannot be left in the full-in position unless the stator contactor is closed, nor can the lever be left in an intermediate position at any time. A further safety feature is an interlock circuit on the starter which prevents closing of the stator contactor unless the starter lever is in the all-resistance-in position. The starter

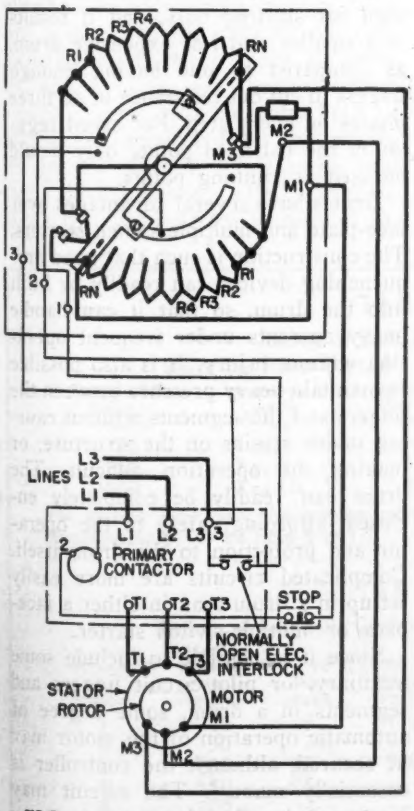


FIG. 1 Connections for a face-plate starter for wound-rotor motor.

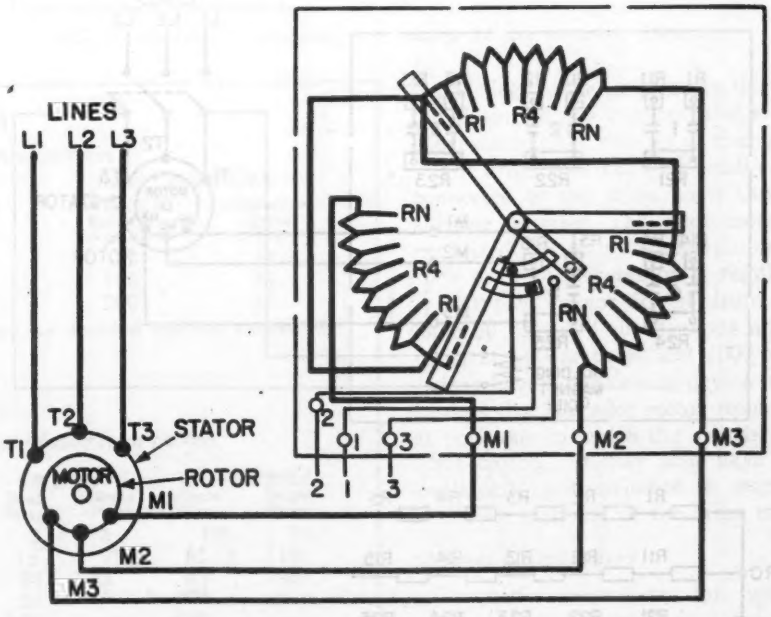


FIG. 2 Connections for a face-plate speed regulator showing the rotor circuit resistance and the three-arm operating lever.

therefore provides a safe method of starting the motor, with reasonable starting currents, and with the possibility of securing any necessary amount of torque by moving the lever to the proper position. It also provides protection against overload, and against power failure, the lever being automatically returned to the off position in either case.

Face-plate starters are made for motors up to 50 horsepower, and having a full-load rotor current of not over 150 amperes.

Face-plate Speed Regulators

Figure 2 shows the connections for a face-plate speed regulator. The resistance is commutated in all three phases at the same time to maintain a balanced condition on all speed points. It is not so difficult to build a three-arm regulating lever, because the spring return feature is not necessary. Regulators of this type are built in sizes up to 40 horsepower, and for rotor currents up to 100 amperes. The usual speed reduction is 50 percent.

Multiple-switch Starters

For larger motors, up to 2000 horsepower, and having rotor currents as high as 1000 amperes, multiple-switch starters are used. Figure 3 shows the wiring diagram of one of these starters. The diagram shows a knife switch handling the stator circuit. For high voltage this might be an oil type circuit breaker. For lower voltages a line starter would be used, or perhaps an air-break circuit breaker. The resistor material is connected into all three phases of the rotor circuit, and so the circuit is balanced on all points of the controller. The contact levers are double pole, and are so arranged mechanically that they must be closed one at a time, and in the proper sequence. Each lever must be held closed until the succeeding lever is closed, which means that two hands must be used. The hand-over-hand operation introduces a desirable time element, preventing the operator from starting the motor too rapidly. When the last lever has been closed it is held in place by a magnetic latch, and because of the mechanical interlocking all of the other levers remain closed. Failure of the power supply will release the latch and permit all of the levers to open, returning the starter to a safe position.

The multiple-switch controller is designed for starting duty only, and is not made in a form suitable for speed regulation.

Drum Controllers

When a motor must be operated frequently a drum controller can be used that will offer a sturdy, easy-operating, and dependable control means. Drums are built to handle both stator and rotor circuits, the cylinder mounting the contact segments, being built in two insulated sections. They are also built to handle the rotor circuit only, the stator then being controlled by a line starter or by a circuit breaker. In either case the drum has a rotatable cylinder of cast iron or brass, on which copper contact segments are mounted. A set of stationary contact fingers is mounted on an insulated shaft, and the fingers are arranged to make contact with the copper segments as the drum cylinder is rotated. The operating handle may be of the rotary, or coffee-mill type, or may operate in a straight line, driving the cylinder through bevel gears. Hand wheels and rope drives are also used.

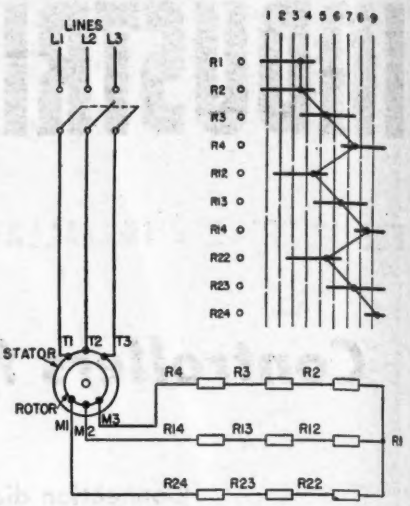


FIG. 4 Connection for a non-reversing drum starter.

Figure 4 shows the connections for a drum starter for a wound-rotor motor. The resistor material is mounted separately from the drum, and connections from the resistor are brought to the drum fingers. As the drum is moved from the off position through positions one to nine, it short circuits steps of resistance alternately in the three phases. Therefore the circuit is balanced on points 0, 3, 6, and 9, and unbalanced on the other points. This does no harm when the controller is used for starting duty, and it results in a smaller and less expensive drum, as compared to one having enough fingers to cut out resistance in all three phases on every step. For speed regulation the balanced points only would be used as running points.

Drums have several advantages over face-plate and multiple-switch starters. The construction is such that good arc-quenching devices can readily be built into the drum, so that it can handle heavy currents under frequent operation without injury. It is also possible to maintain heavy pressure between the fingers and the segments without causing undue strains on the structure, or making the operation difficult. The drum can readily be completely enclosed, affording safety to the operator and protection to the drum itself. Complicated circuits are more easily set up in a drum than in either a face-plate or multiple-switch starter.

Since it is possible to include some auxiliary, or pilot-circuit fingers and segments in a drum, some degree of automatic operation of the motor may be secured, although the controller is essentially manual. The circuit may be arranged so that the stator contactor can be closed only in the off position

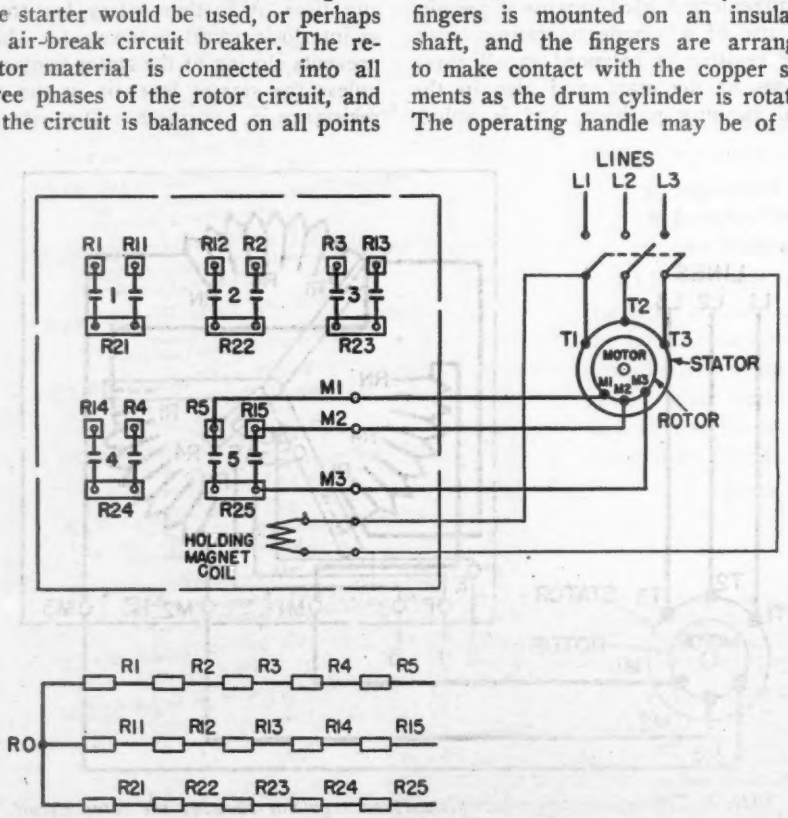


FIG. 3 Connections for a wound-rotor motor multiple-switch starter.

of the drum, but will maintain itself closed in all other positions, thus giving low-voltage, or power-failure, protection. The circuit is shown in Fig. 5. With this arrangement all making and breaking of the current occurs in the drum. The circuit can readily be arranged so that the line contactor will make and break the current. To do this the contactor coil is closed on the first drum position instead of the off position, as shown in Fig. 6. Both arrangements are in common use. The advantages of both may be secured by using a control relay in addition to the line contactor, the relay being energized in the off position, and the contactor in the first position of the drum. Limit switches to open the circuit when a machine has reached a selected position, may also be used with a drum controller, provided that the stator circuit of the motor is controlled by a contactor.

NEMA standard ratings for a.c. drums are shown in Table I.

Motor-driven Drums

Stokers, blowers, and large air-conditioning units often use relatively large motors, and require close automatic speed regulation. Motor-driven drums may be used for such applications. The construction of the drum differs from that previously described, in that cam-operated switches are used in place of the segment and finger construction. The drums are built with either 13 or 20 balanced speed-regulating points, and the cam switch construction saves space when so many balanced points are needed. Each switch carries two contacts, both of which are connected to the middle leg of the resistor. They make contact simultaneously with stationary contacts, one connected to each of the outside legs of the resistor. In this way the closing of any cam-operated switch short-circuits the resistor at that point.

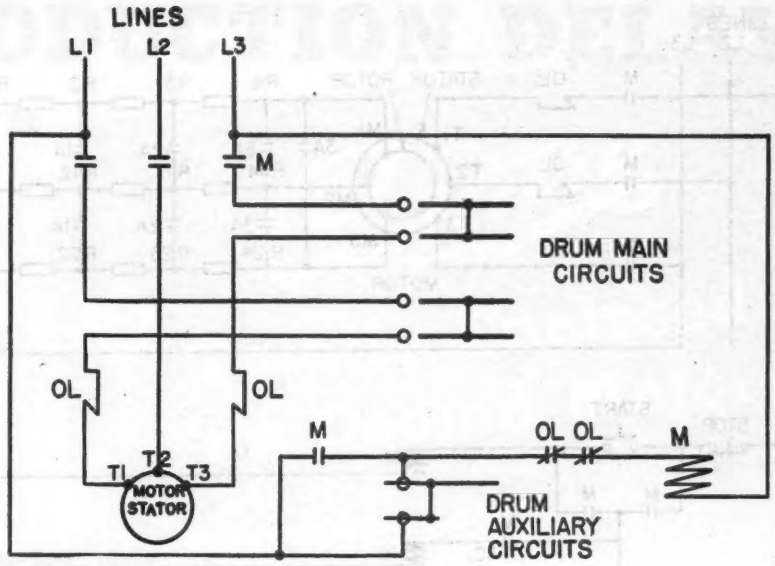


FIG. 5 Method of obtaining low-voltage protection with a drum controller.

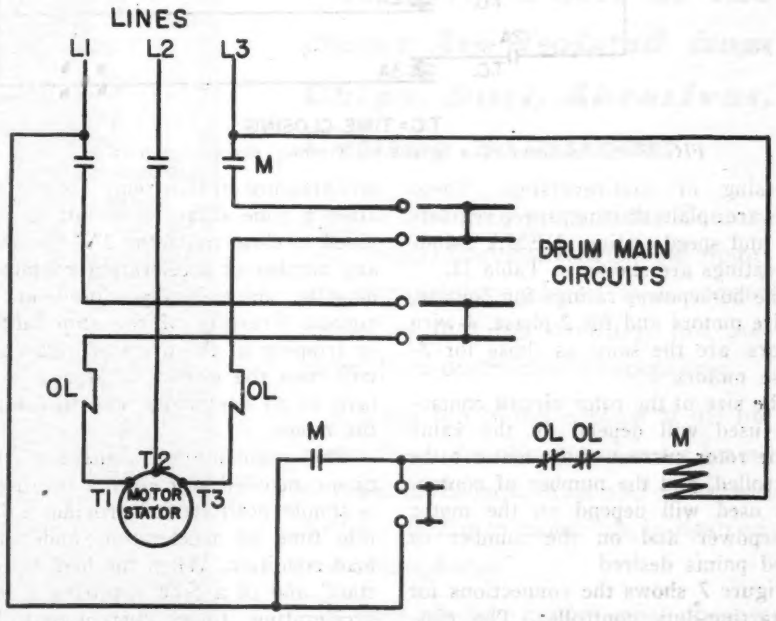


FIG. 6 Method of obtaining low voltage release or drum protection.

The drum is driven by a small motor connected to the drum shaft through suitable gearing. The pilot motor is energized by some automatic device such as a thermostat or a regulator.

A typical motor-driven drum may have 20 balanced speed points and be rated at 600 amperes and 1000 volts. It may have a positioning device which insures that the pilot motor stops only at positions in which the switches are fully closed. It may also have self-contained limit switches to stop the motor at each end of the drum travel.

Magnetic Controllers

Magnetic controllers for wound-rotor motors are made in three general types, any of which may be either

TABLE I

Ratings of Enclosed Drum Switches

Stator and Rotor Control			Rotor Control Only	
Standard 8 hr. Rating in Amperes	Number of Control Points	Intermittent Duty Rating Amperes	Standard 8 hr. Rating in Amperes	Number of Control Points
75	5 or 6	95	75	11
150	7 or 8	190	150	11
300	9 or 10	380	300	11

For starting duty only the ampere ratings may be doubled and the number of starting points may be from 8 to 10.

TABLE II

Ratings of Magnetic Controllers for Wound-rotor Motors

NEMA Size Number	8-Hr Open Rating of Controller Amperes	HP at 110V		HP at 220V		HP at 440-550V	
		Three Phase	Single Phase	Three Phase	Single Phase	Three Phase	Single Phase
1	25	3	1½	5	3	7½	5
2	50	7½	3	15	7½	25	10
3	100	15	7½	30	15	50	25
4	150	25	—	50	—	100	—
5	300	—	—	100	—	200	—
6	600	—	—	200	—	400	—

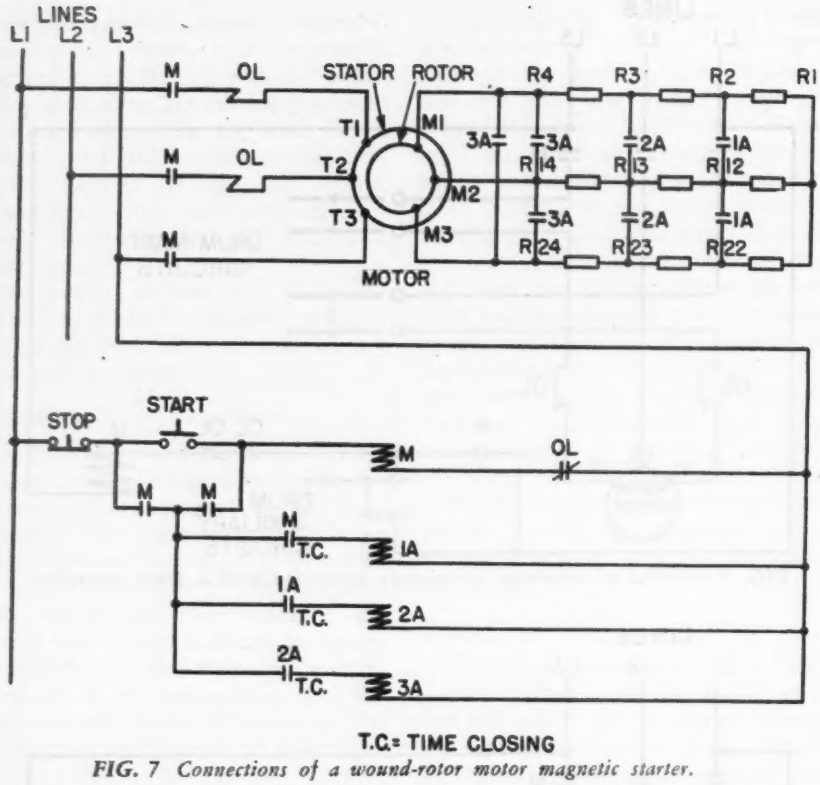


FIG. 7 Connections of a wound-rotor motor magnetic starter.

reversing or non-reversing. These types are: plain starting, speed regulating, and speed setting. NEMA standard ratings are shown in Table II.

The horsepower ratings for 2-phase, 3-wire motors and for 2-phase, 4-wire motors, are the same as those for 3-phase motors.

The size of the rotor circuit contactors used will depend on the value of the rotor current of the motor to be controlled, and the number of contactors used will depend on the motor horsepower and on the number of speed points desired.

Figure 7 shows the connections for a starting-duty controller. The closing of the rotor circuit contactors is under the control of timing relays. In this instance the relays are of the dashpot type, and are mechanically fastened to, and operated by, the motor contactors. When the starting push button is pressed, the stator contactor M is energized and closes, connecting the stator to the power supply lines. An auxiliary switch, or interlock switch, on M, is also closed to provide a circuit around the start button. Closing of the interlock also provides a circuit to energize the first accelerating contactor 1A, but the circuit is not as yet complete. When M closes it compresses a spring which in turn exerts a pressure to close the timing relay TR-M. The closing of TR-M is retarded by a dash pot. After a time delay TR-M closes, completing the circuit to the coil of 1A, which then also closes, short-circuiting the first step of controller resistor. The closing of 1A exerts pressure on time relay TR-1A, and after a time delay, a circuit is provided to close contactor 2A. Similarly any number of accelerating contactors may be automatically closed in sequence. Pressing of the stop button, or tripping of the overload relay OL, will open the circuit to M and so in turn to all contactors, and disconnect the motor.

The majority of controllers use time-controlled acceleration because it is simple, positive, and provides a definite time of acceleration under any load condition. When the load is constant, and of a type requiring a long accelerating time, current-controlled relays may be used instead of time relays. Machines having heavy fly wheels, large extractors, and similar machines, may use current-controlled acceleration to advantage.

It will be evident that the starter described may easily be arranged for speed regulation. It is only necessary to provide a multiple push button, or a small drum master switch, so that the coil circuits of the rotor contactors may be independently controlled.

Speed setting is desirable on printing presses and other machines which may be frequently stopped, and which, when restarted, should return to the speed at which they were running before being shut down. An ordinary speed regulating controller may be used this way if the amount of speed regulation is small, but if it is large the resistor will limit the motor current to a value too low to permit restarting. To avoid the difficulty, speed-setting controllers are often equipped with an additional rotor-circuit contactor which is connected so as to short-circuit just enough of the resistor to provide the maximum starting torque. The coil of the contactor is so connected that the contactor will close with the M contactor, and remain closed as long as the operator keeps his finger on the start button. When the motor has accelerated the operator releases the button, the high-torque contactor opens, and the motor assumes the desired running speed as determined by the selector.

Some machines require a large number of running speeds, and with magnetic control the number of rotor-circuit contactors required may increase the size and cost of the control beyond reasonable limits. Figure 8 shows a method of obtaining a large number of speeds with a relatively small number of contactors. Here the resistor steps are tapered in ohmic value according to a geometric ratio, and the contactors are closed in various combinations instead of in a fixed sequence. Figure 16 shows a total resistance of 15 ohms, arranged in four steps of 1, 2, 4, and 8 ohms. Closing contactor 1A only will leave 14 ohms in circuit. Closing 2A only will leave 13 ohms., Closing 1A and 2A will leave 12 ohms. Similarly any resistance from 0 to 15 ohms, in steps of 1 ohm, may be obtained. The controller thus gives sixteen speeds with the use of four contactors. With five contactors, thirty-two speeds may be obtained.

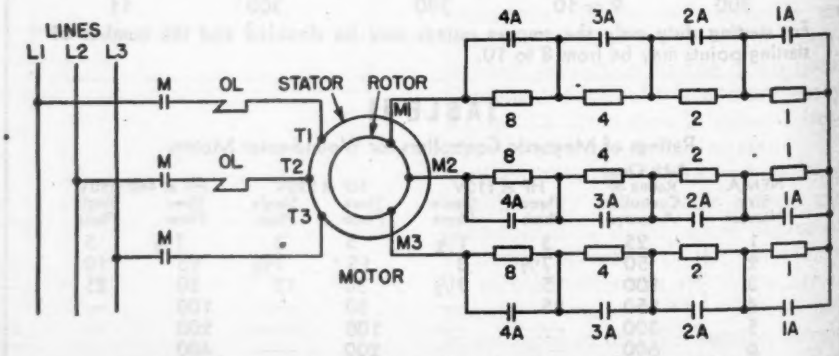


FIG. 8 Sixteen point speed regulator for a wound-rotor motor.

AVOID PRODUCTION DELAYS

WITH

Century Totally Enclosed Fan Cooled Motors

The Vital Parts of the Motor Are Isolated from Chips, Dust, Abrasives, Cutting Solutions.

The operating parts of the Century Totally Enclosed Fan Cooled Motors are completely enclosed in a rugged frame, so that the windings are protected from destructive atmospheres.

A large fan blows a blast of air between the laminations and outer frame — keeping the motor cool and clean and further adding to motor life in destructive atmospheres.

If your electric motors must operate in atmospheres containing destructive dusts, chips, cutting solution fogs, abrasives, or similar destructive materials, find out how Century Totally Enclosed Fan Cooled Motors can help prevent production delays. A Century engineer will be glad to discuss your problem with you.

CENTURY ELECTRIC CO.
1806 Pine Street St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

TEFC with fan protecting housing removed showing the fan and the openings between the laminations and outer frame.

Century TEFC heavy end bracket.

TEFC frame and field winding. Note the long fit between the frame and end bracket.

Century C MOTORS

392

DATA SHEET

The number at the right is a classification for convenience in filing and for a future data sheet index

G-4

Instrument Connections

A. C. MEASUREMENTS [continued]

WATTMETER

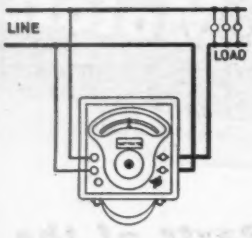


FIG. 8 Wattmeter

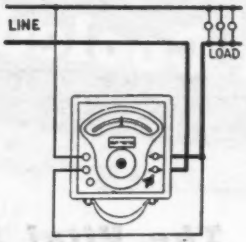


FIG. 9 Wattmeter

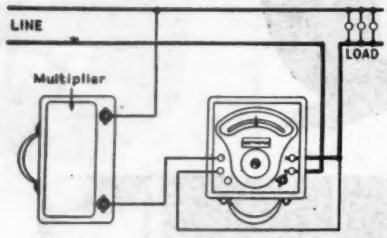


FIG. 10 Multiplier and wattmeter

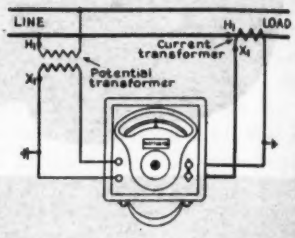


FIG. 11 Wattmeter with transformers

In Fig. 8, the instrument is measuring power load plus loss in its own current-coil circuit. If the instrument reads backwards, reverse the *current* leads. In Fig. 9, the instrument is measuring power load plus the loss in its own potential circuit.

Potential transformers are recommended on circuits above 300 volts. On circuits of 750 volts and above, potential and current transformers should be used. ALWAYS GROUND THE SECONDARY OF THE POTENTIAL TRANSFORMER CIRCUIT.

Special care should be taken not to overload wattmeters. It is possible to burn out a wattmeter without exceeding the full-scale reading. The reason is that a wattmeter reading is dependent on three factors: voltage, current and power factor.

VOLTMETER AND WATTMETER

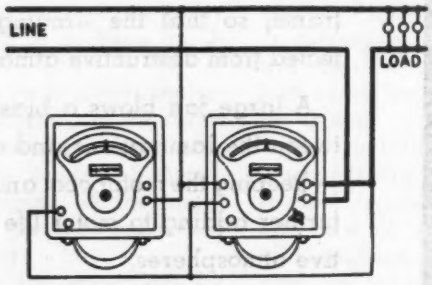


FIG. 12 Voltmeter and wattmeter

In Fig. 12 the wattmeter measures power load plus losses in the voltmeter and wattmeter potential circuits.

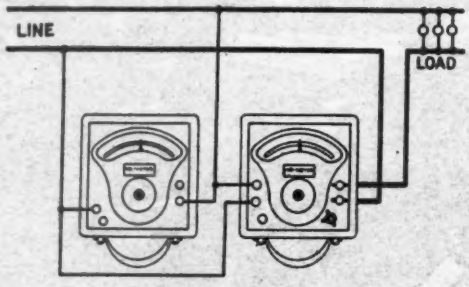


FIG. 13 Voltmeter and wattmeter

In Fig. 13, the wattmeter measures power load plus loss in its own current-coil circuit.

VOLTMETER, WATTMETER AND AMMETER

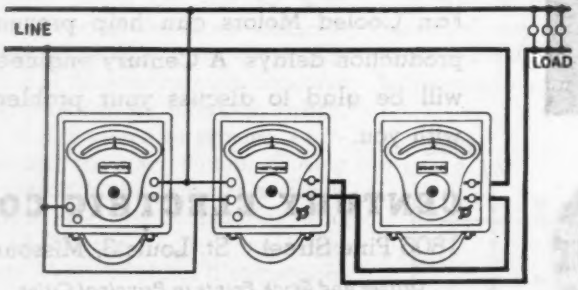


FIG. 14 Voltmeter, wattmeter and ammeter

Power factor is determined by dividing the wattmeter reading by the product of the ammeter and voltmeter readings.

In Fig. 14, the wattmeter measures power load plus losses in the ammeter and wattmeter current-coil circuits.

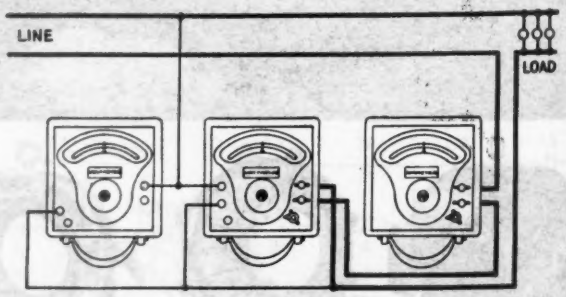


FIG. 15 Voltmeter, wattmeter and ammeter

In Fig. 15, the wattmeter measures the sum of the power losses of the load, the potential circuit of the wattmeter, and the voltmeter.

Data from General Electric Co.

Explosion-proof
Weather-tight *Water-tight*
RECEPTACLES *and* PLUGS

Since 1902
the
standard for
CHEMICAL
FOOD
MARINE
POWDER
REFINERY
TEXTILE
and all outside installations

"Fairweather" electrical engineers and contractors did not contribute materially to winning the war.

But the legion of electrical men who foresaw every eventuality of vapor, moisture, dust, water, explosion, and broken connections are watching the operation of their plants, outdoor jobs, ships and commercial buildings with just satisfaction.

That Russell & Stoll anticipated the requirements is evidenced by the volume of war business received and by the 300 page Catalog No. 90 which is in the hands of leading jobbers and contractors everywhere.

From receptacles to Ever-Lok connectors and lighting fixtures, and circuit breakers to panel boards, you will find an R & S fixture or fitting that will exactly meet your requirements.

If you are working on a postwar job or designing an electrically operated machine for a hazardous location, we would be glad to talk it over now.

RUSSELL & STOLL COMPANY

125 BARCLAY STREET • NEW YORK 7, N. Y.

EXPLOSION-PROOF, WATER-TIGHT, AND EVER-LOK

DATA SHEET

The number at the right is a classification for convenience in filing and for a future data sheet index

G-5

Instrument Connections

A. C. MEASUREMENTS [continued]

WATTMETER

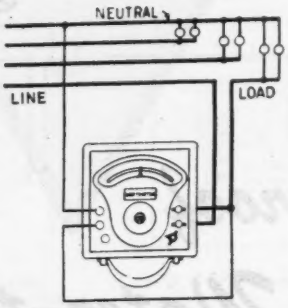


FIG. 16 Single-phase wattmeter in balanced 3-phase, 4-wire circuit

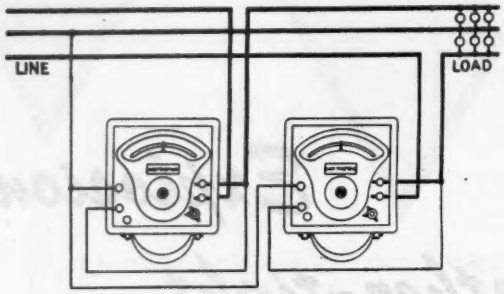


FIG. 17 Two wattmeters connected for 3-phase balanced or unbalanced voltages or load

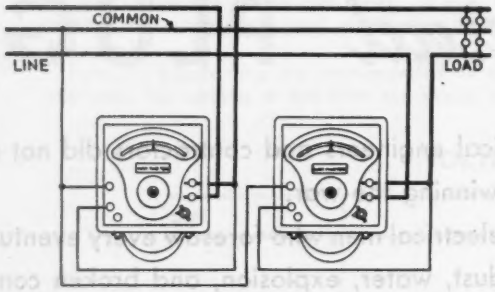


FIG. 18 Two wattmeters connected for 2-phase 3-wire balanced or unbalanced load

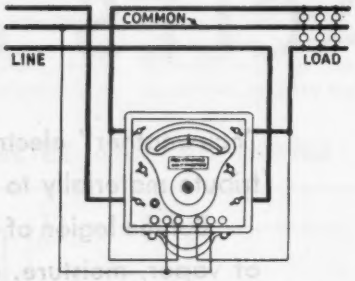


FIG. 19 Polyphase wattmeter in 2-phase 3-wire circuit, balanced or unbalanced load

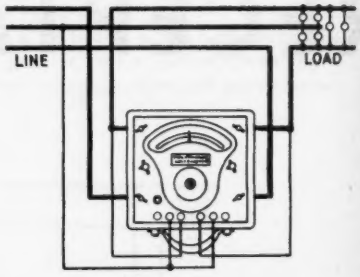


FIG. 20 Polyphase wattmeter in 3-phase, 3-wire circuit

While only the wattmeter connections are shown, the ammeters and voltmeters can be connected as shown in the two preceding diagrams.

In Fig. 16, the power of the system is three times the indications of the wattmeter. The wattmeter indicates its own potential losses plus the power in one phase of the load.

In Fig. 17, the two wattmeters will not indicate alike, even if the load is balanced. Above 50 percent power factor, the three phase power is the sum of the two readings; below 50 percent power factor, it is necessary to reverse the reading of one wattmeter (by reversing its *current* leads) and then take the difference between the two instrument readings.

The accuracy of tests made with single-phase wattmeters will be somewhat higher than those made with polyphase wattmeters.

Voltage ranges can be extended by the use of multipliers or transformers. For high accuracy, use the instruments at 40 percent of rated current or above.

POWER FACTOR METER

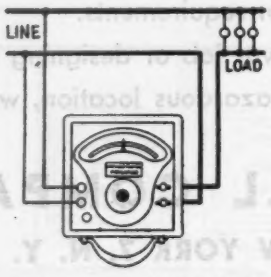


FIG. 21 Single-phase power factor meter

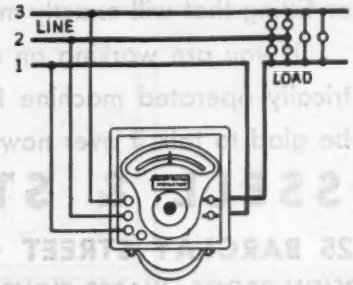


Fig. 22 3-wire, 3-phase power factor meter

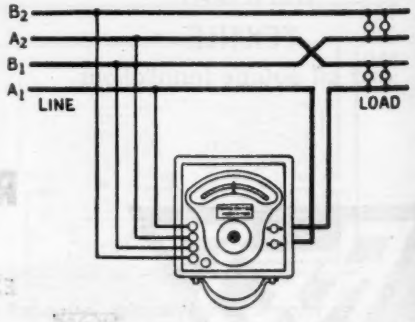


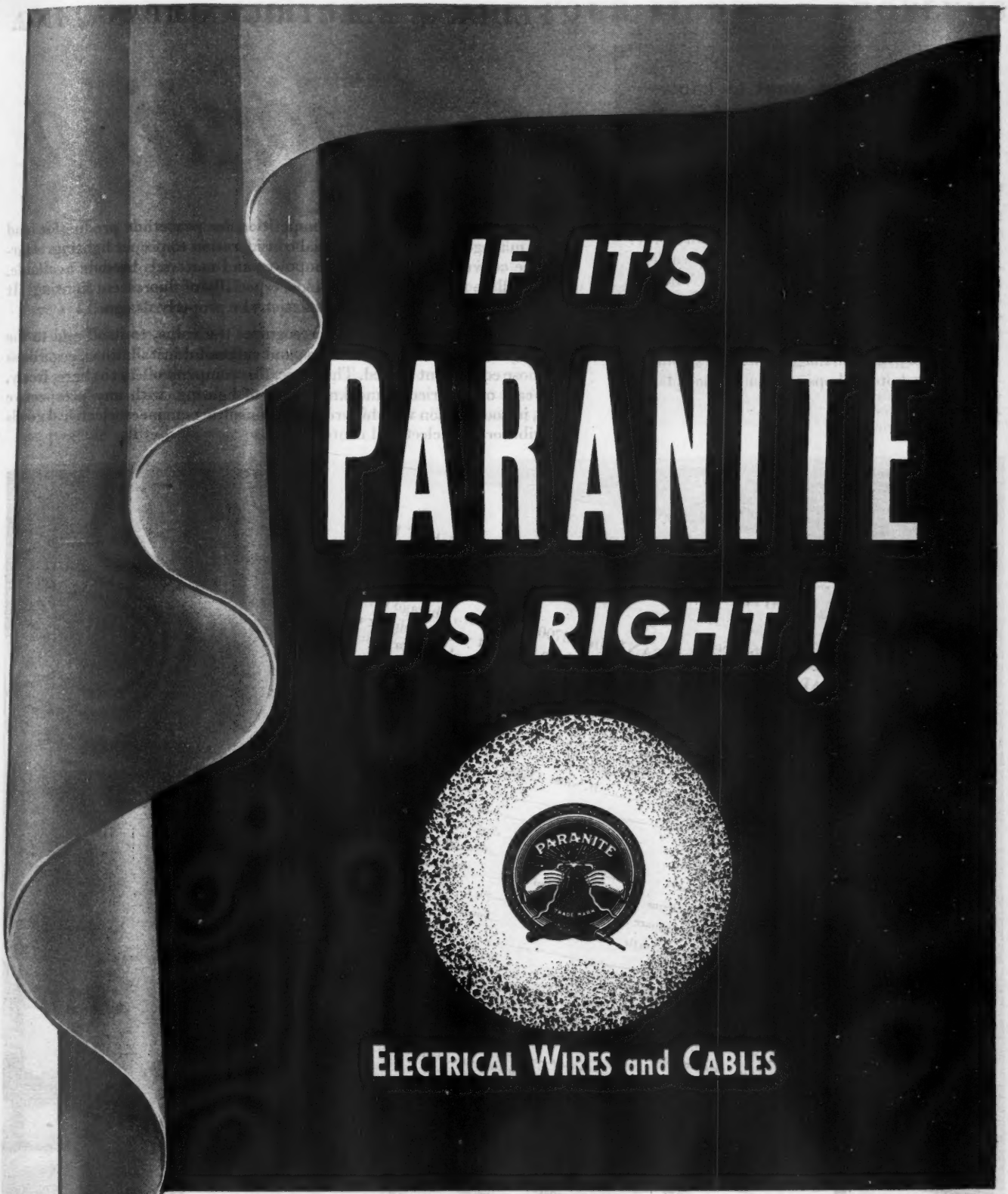
Fig. 23 4-wire, 2-phase power factor meter

These connections, made exactly as shown, are correct at all power factors.

Polyphase power factor meters are intended for use in balanced circuits only.

Single-phase power factor meters should be used only at the calibrated frequency.

Data from General Electric Co.



"BETTER THAN CODE REQUIRES"

PARANITE WIRE AND CABLE CORPORATION

Division of

ESSEX WIRE CORPORATION

FT. WAYNE, INDIANA

DATA SHEET

The number at the right is a classification for convenience in filing and for a future data sheet index

G-5

Instrument Connections

A. C. MEASUREMENTS [continued]

WATTMETER

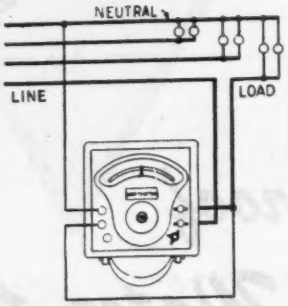


FIG. 16 Single-phase wattmeter in balanced 3-phase, 4-wire circuit

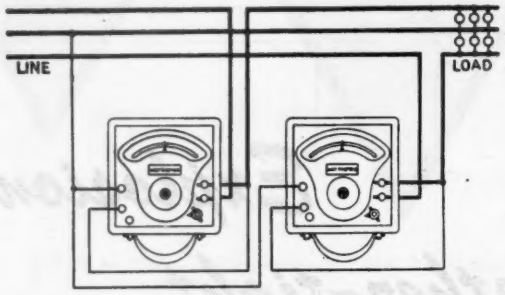


FIG. 17 Two wattmeters connected for 3-phase balanced or unbalanced voltages or load

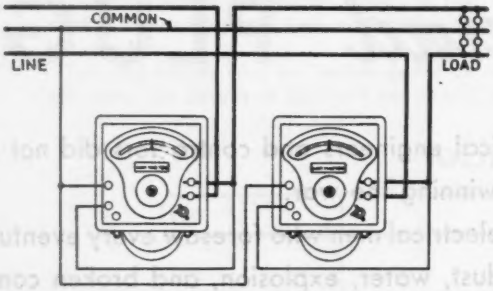


FIG. 18 Two wattmeters connected for 2-phase 3-wire balanced or unbalanced load

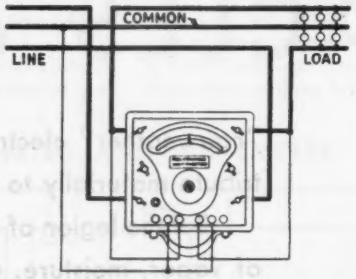


FIG. 19 Polyphase wattmeter in 2-phase 3-wire circuit, balanced or unbalanced load

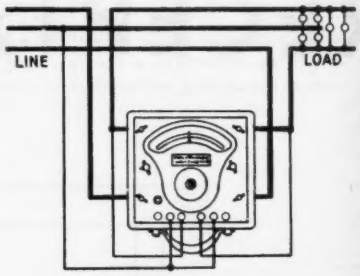


FIG. 20 Polyphase wattmeter in 3-phase, 3-wire circuit

While only the wattmeter connections are shown, the ammeters and voltmeters can be connected as shown in the two preceding diagrams.

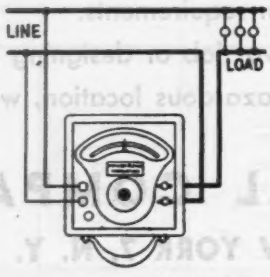
In Fig. 16, the power of the system is three times the indications of the wattmeter. The wattmeter indicates its own potential losses plus the power in one phase of the load.

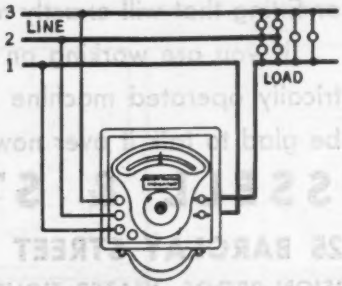
In Fig. 17, the two wattmeters will not indicate alike, even if the load is balanced. Above 50 percent power factor, the three phase power is the sum of the two readings; below 50 percent power factor, it is necessary to reverse the reading of one wattmeter (by reversing its *current* leads) and then take the difference between the two instrument readings.

The accuracy of tests made with single-phase wattmeters will be somewhat higher than those made with polyphase wattmeters.

Voltage ranges can be extended by the use of multipliers or transformers. For high accuracy, use the instruments at 40 percent of rated current or above.

POWER FACTOR METER





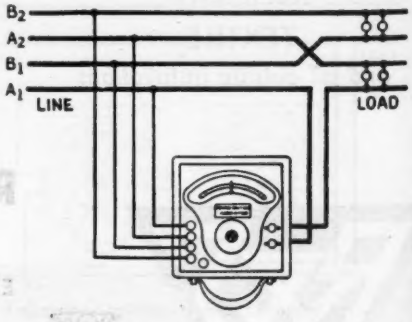


FIG. 21 Single-phase power factor meter Fig. 22 3-wire, 3-phase power factor meter Fig. 23 4-wire, 2-phase power factor meter

These connections, made exactly as shown, are correct at all power factors.

Polyphase power factor meters are intended for use in balanced circuits only.

Single-phase power factor meters should be used only at the calibrated frequency.

Data from General Electric Co.

IF IT'S PARANITE IT'S RIGHT!

ELECTRICAL WIRES and CABLES

"BETTER THAN CODE REQUIRES"

PARANITE WIRE AND CABLE CORPORATION

Division of

ESSEX WIRE CORPORATION

FT. WAYNE, INDIANA

FEDERAL ELECTRIC COMPANY, INC.

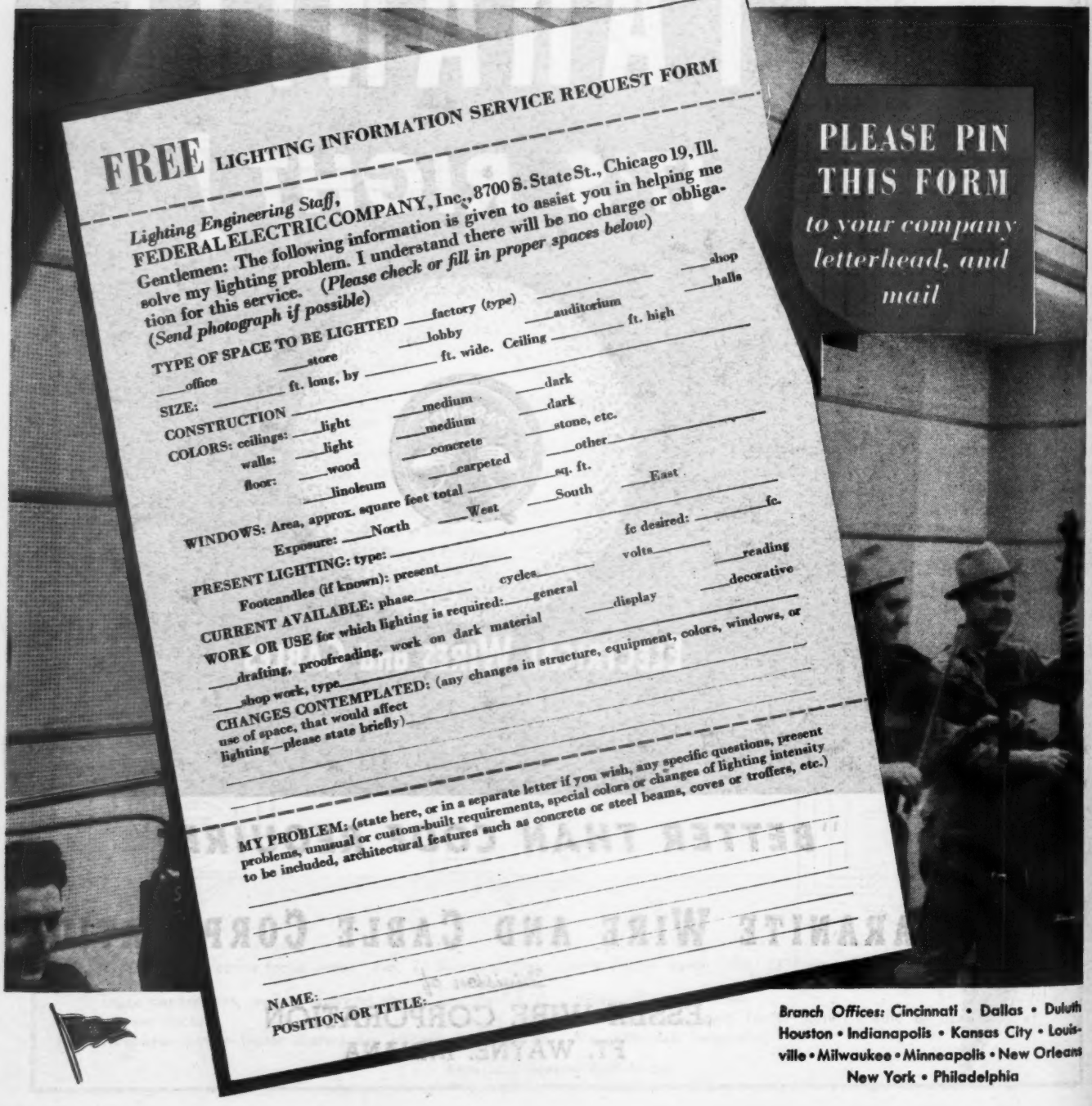
Lighting

What do you want to know about your lighting problem?

Federal Electric Company, Inc. offers help, through "Lighting Information Service." Fill in the form below, attach it to your company letterhead, and mail it, with a detailed letter if you wish. Federal Electric Company, Inc. lighting engineers will study your problem, and give you their recommendation. There is no charge or obligation for this service, except your cooperation in giving us full information. Available to architects, engineers, distributors, contractors, and managers of stores, offices, buildings, hotels, shops, and industrial plants.

In planning to meet the keen competition for peacetime production and sales, management is giving special consideration to proper lighting. During the conversion period, as manpower and materials become available, there will be many new installations, especially of fluorescent lighting. It is important that these new installations be properly designed.

Federal Electric Company, Inc. recognizes the value, to itself and to the lighting industry, of satisfied users, and successful installations, regardless of whose equipment is used. Therefore, this company offers to share, freely, its years of experience and knowledge of lighting, with any prospective user, in cooperation with his architect, consulting engineer, electrical goods distributor, and electrical contractor.



FREE LIGHTING INFORMATION SERVICE REQUEST FORM

Lighting Engineering Staff,
FEDERAL ELECTRIC COMPANY, Inc., 8700 S. State St., Chicago 19, Ill.
Gentlemen: The following information is given to assist you in helping me solve my lighting problem. I understand there will be no charge or obligation for this service. (*Please check or fill in proper spaces below*)
(*Send photograph if possible*)

TYPE OF SPACE TO BE LIGHTED ___office ___store ___factory (type) ___lobby ___auditorium ___shop ___halls

SIZE: _____ ft. long, by _____ ft. wide. Ceiling _____ ft. high

CONSTRUCTION ___medium ___dark

COLORS: ceilings: ___light ___medium ___dark
walls: ___light ___medium ___dark
floor: ___wood ___concrete ___stone, etc.
___linoleum ___carpeted ___other

WINDOWS: Area, approx. square feet total _____ sq. ft.
Exposure: ___North ___West ___South ___East

PRESENT LIGHTING: type: _____ fc desired: _____ fc.

Footcandles (if known): present _____

CURRENT AVAILABLE: phase _____ cycles _____ volts _____

WORK OR USE for which lighting is required: ___general ___display ___reading
___drafting, proofreading, work on dark material ___decorative
___shop work, type _____

CHANGES CONTEMPLATED: (any changes in structure, equipment, colors, windows, or use of space, that would affect lighting—please state briefly) _____

MY PROBLEM: (state here, or in a separate letter if you wish, any specific questions, present problems, unusual or custom-built requirements, special colors or changes of lighting intensity to be included, architectural features such as concrete or steel beams, coves or troffers, etc.) _____

NAME: _____

POSITION OR TITLE: _____

Branch Offices: Cincinnati • Dallas • Duluth Houston • Indianapolis • Kansas City • Louisville • Milwaukee • Minneapolis • New Orleans New York • Philadelphia

ANNOUNCES HELP IN SOLVING YOUR LIGHTING PROBLEMS

Information Service

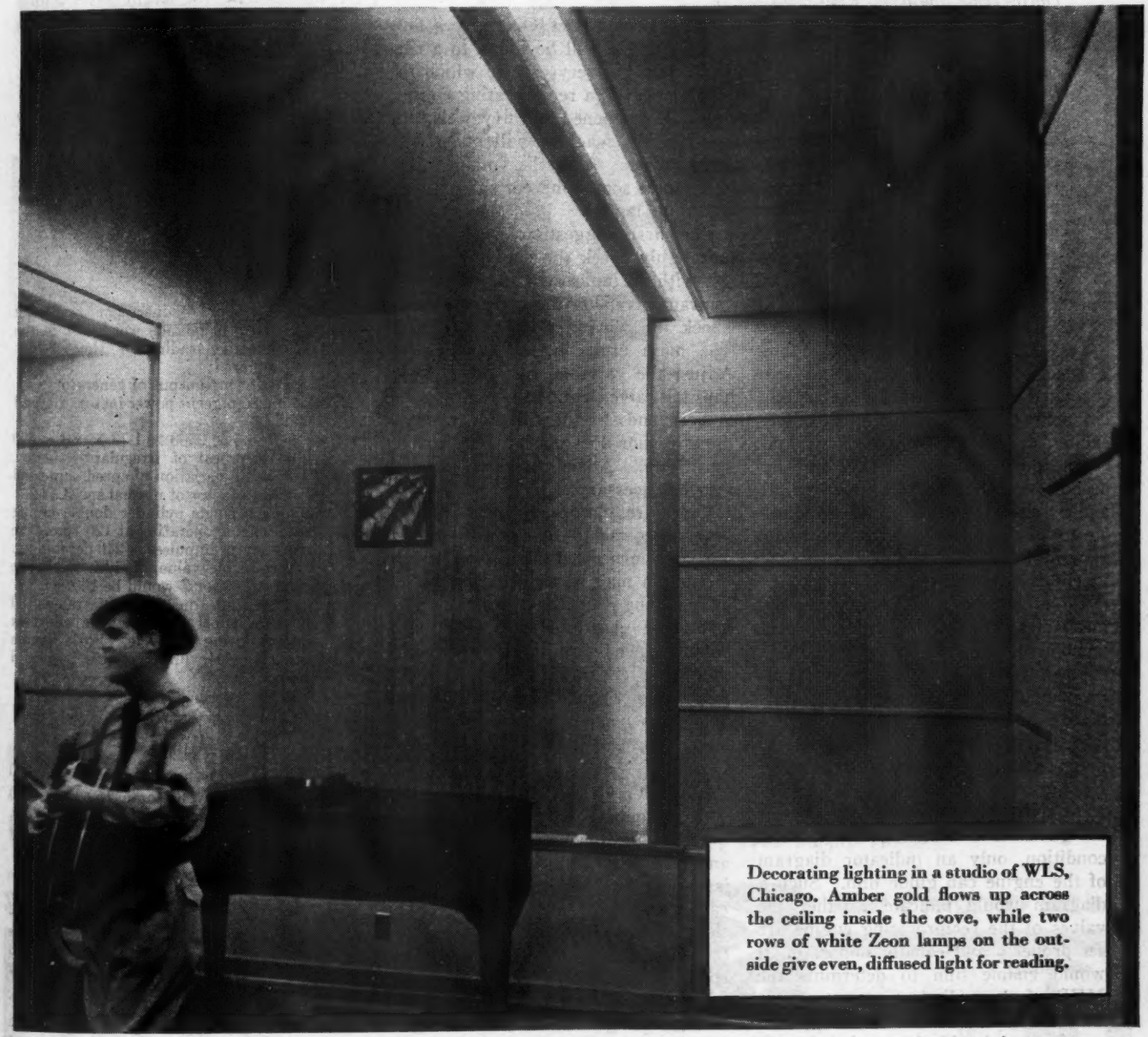
As a leader in the manufacture of gaseous discharge tubular lamps for 15 years, Federal Electric Company, Inc. and its engineers have solved thousands of lighting problems. They know how to secure the most efficient lighting at minimum cost. They also know what not to do, and can help users avoid mistakes which might prove disappointing and costly.

To make this help available to more prospective users than its engineers could possibly reach personally, the company now offers "Lighting Information Service." You, your architect, engineer, or contractor, are invited to submit your lighting problem on the form below, or in a detailed letter if you wish. Our engineering staff will make a sincere effort to give you the best possible solution to your problem.

ZEON COLD CATHODE

There are 2 kinds of fluorescent lighting

"Hot Cathode" is the common heater filament type of fluorescent lighting; "Cold Cathode" is the improved, shell electrode type, of which Zeon is the outstanding example. Long life, lower maintenance cost, and greater flexibility are distinguishing features.



Decorating lighting in a studio of WLS, Chicago. Amber gold flows up across the ceiling inside the cove, while two rows of white Zeon lamps on the outside give even, diffused light for reading.

FEDERAL ELECTRIC COMPANY, INC. LIGHTING DIVISION

8700 S. STATE ST., CHICAGO 19, ILL
TELEPHONE VINCENNES 5300

225 N. MICHIGAN AVE., CHICAGO 1, ILL.
TELEPHONE STATE 0488

SUBSIDIARY COMPANY • • • FEDERAL BRILLIANT COMPANY, ST. LOUIS, MO

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay $5.00.

READER'S QUIZ

VOLTAGE REGULATOR AND GENERATOR

QUESTION 150. I have a type PDA-3A, 115 volt, 60 cycle voltage regulator operating in conjunction with a 2300 volt, 188.5 amp., 3 phase, 60 cycle, 120 rpm. generator that is directly connected to a reciprocating steam engine. The trouble I am having is with the control of the voltage which constantly rises and falls in step with the revolutions of the engine. The armature of the regulator also dips up and down in step. Can someone give me a solution for correcting this condition?—F.L.C.

A. TO QUESTION 150. I am not convinced that the trouble emanated from the voltage regulator. No mention was made as to the exciter, exciter drive, type of alternator and engine governor. Therefore, only by process of elimination of mechanical and/or electrical possibilities responsible for the described erratic engine or generator operation, will he succeed in eliminating his trouble.

First he should try to analyze the mechanical system. With the aid of a tachometer he should check the speed of the engine. If the tachometer reading should fluctuate, or as F.L.C. puts it, rise and fall with reciprocating motion of the engine this would clearly indicate trouble of a mechanical nature. Next in line would be to check the governor and governor setting; if however, the governor and setting is in perfect condition, only an indicator diagram of the engine can guide him. Such a diagram would indicate whether the valves of the reciprocating engine are set properly and equally important, it would enable him to determine the MEP of the cylinders.

Now to the electrical end, check voltage control by blocking, shunting or shorting the control and observe the instruments. Check exciter, all connections thoroughly, and if compound wound, see that exciter is compounded properly. Check exciter armature windings for open or short circuit; brushes, brushholders; if alternator is of the rotating field type, check all connections to and from and including the slip rings.—A.C.

A. TO QUESTION 150. This trouble will be found to a certain extent in every case in which the prime mover is a reciprocating engine. Even if dampened by flywheels, the speed of the machine will pulse with every stroke. Also, the voltage regulators have some inherent sluggishness and time lag.

The first suggestion would be to thoroughly check the engine. Take a test with an indicator and see that the diagram given on the card is correct. Check for bearing play in the eccentric, main crank, valve linkage, etc. Adjust the valves if necessary. Perhaps the valve clearance is not the same at both ends of the cylinder. Maybe the governor does not have the correct sensitivity. Added flywheel capacity may be necessary.

On the regulator end, check the auxiliary rheostat to see that it has not partially burned out. On some models, the action may be adjusted by adding or removing shot from the cup hanging below the main contacts. The dashpots may need cleaning or adjusting or the spring tension may be wrong on the relay magnet contacts. A maintenance bulletin is usually obtainable from the manufacturer.—L.E.B.

A. TO QUESTION 150. Your trouble seems to be in not having enough flywheel effect in engine and generator at this slow speed. There is a considerable change in speed for each steam cylinder impulse. This slowing down between impulses causes the voltage to drop. The speed of response of regulator and exciter and generator is not fast enough for the voltage change caused by the change in speed to be compensated in the action of the regulator. The attempt is made, however, as indicated by the dipping of the regulator armature. Of course, the frequency also varies up and down from 60 cycles, with 60 cycles as an average at 120 rpm.

I suggest the addition of a flywheel to keep the change in speed during a revolution to a practical minimum. Assuming you have only one generator on the system, to obtain satisfactory operation, the flywheel effect should be not less than a WR^2 value of about 3,000,000. Obtain the WR^2 from engine and generator manufacturer and add an additional flywheel to make up the difference so as to have the proper total flywheel effect required.

The total flywheel effect is arrived at as follows:

$$WR^2 = \frac{130 \times \text{kw.} \times Z}{\left(\frac{\text{rpm.}}{100}\right)^3} \times \frac{A_2}{A_1}$$

WR^2 = Moment of inertia of rotating parts in pounds weight times the effective radius of the weight squared;

kw. = kilowatt output of generator

Assuming 80 percent power factor, the load would be

kw. $= 188.5 \times 2300 \times 1.73 \times .80 = 600$

Z = reciprocal of irregularity factor, being variation of speed expressed as a factor of normal speed.

Assuming a single cylinder double acting steam engine operating at 120 rpm., the frequency of impulses is 240 per minute. A permissible value of 1/Z would be about 1/160, or Z would be 160.

A2/A1 depends on shape of tangential curve of effort, or how the effort is applied during the cycle. For a double acting single cylinder engine it would be about 0.4.

$$\text{Then } WR^2 = \frac{130 \times 600 \times 160}{\left(\frac{120}{100}\right)^3} \times 0.4$$

$= 2{,}885{,}000$ or approximately 3,000,000

Average value of WR^2 for a 750 kva. (600 kw.) 120 rpm. generator is about 100,000.

WR^2 of flywheel may be approximately calculated as follows:

$WR^2 = 22wtr^3$; where w = width of flywheel rim in inches

t = thickness of flywheel rim in inches

r = radius of wheel to center of rim in feet.

Thus, this calculated value for the present flywheel plus the engine and generator WR^2 will indicate the approximate amount of additional flywheel effect required to iron out the fluctuations.—L.R.B.

This 4-Wheel RIDGID cuts pipe *fast*

Workholder sets to pipe size instantly

Dies set to pipe size in 10 seconds

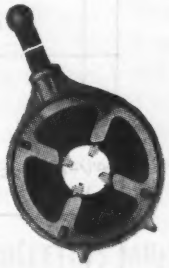
Here's your next new work-saver die stock!

Regular RIDGID *Heavy-Duty Cutter —5 sizes to 6" pipe.*

Even where you have room only for a quarter turn . . .

● Clean speedy pipe and conduit cutting —the 4 cutting wheels and short handle of this No. 42 make it easy, especially in tight places where you barely have space for a quarter turn. It's a husky tool, well balanced, with strong malleable frame that keeps the heat-treated special steel wheels always cutting true. It comes in two sizes: No. 42, capacity ½" to 2"; No. 44, 2½" to 4". For fast easy pipe cutting anywhere, ask your Supply House for this efficient 4-wheel RIDGID.

RIDGID No. 65R—Perfect Threads on 1" to 2" pipe or conduit with *one* set of dies



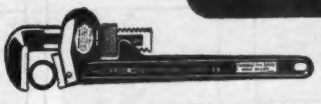
No. 65R looks like this in front.

● Start your post-war right—with a threader you'll enjoy using. No bother changing dies in this RIDGID—spin it up, spin it down and it's set for micrometer perfect threads on 1", 1¼", 1½" or 2" pipe or conduit. A quick turn of gauge plate sets workholder, no bushings. Threads with surprisingly little effort. High-speed steel dies; rugged steel-and-malleable construction. Ask for it at your Supply House.

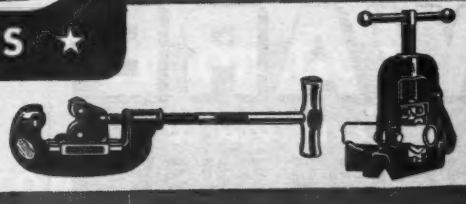
Sold by Supply Houses Everywhere

RIDGID ★ PIPE TOOLS ★

Millions of RIDGID Tools in use

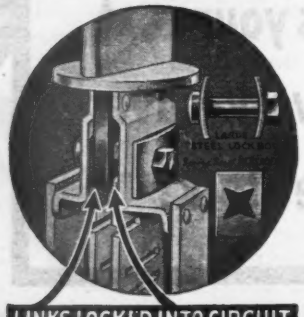


THE RIDGE TOOL COMPANY
Elyria, Ohio, U. S. A.



End Shutdowns with COOL FUSES

WARE HI-LAG



NON-HEATING CONTACTS

Keep Motors Humming

100% Quality

APPROVED BY UNDERWRITERS

WARE BROTHERS

4410 W. Lake St. Chicago 24, Ill.

WARE

Renewable

HI-LAG FUSES

REMOTE MOTOR CONTROL

QUESTION 151. We want to control six 200 hp. 440 volt motors at a remote point about three and one half miles away, each motor to have separate start and stop controls, also separate continuous lamp indication of the running or off periods of the motor. We want to use a minimum number and size of conductors. What would be the best way to do this? There is available 110 volts on a control transformer at the motors, also 120–208 volts 60 cycles and 125 volt d.c. battery are available at the remote point. The motors are located on an average of about 2000 feet apart, with the nearest one about one and a quarter miles from the remote point.—L.R.B.

A. TO QUESTION 151. The simplest way to control a motor from a remote control point is as shown in Fig. No. 1. This provides for undervoltage protection against failure of the 208 volt control circuit, and it will be necessary to depress the start button again before starting up. If voltage failed on the 440 volt circuit, the motor would start up when the 440 volt power returned, because CR1 would still be energized. This, however, could be prevented by putting a voltage coil across the line side of the 440 volt magnetic switch with its contacts in series with the holding circuit to the coil of CR1, and then when 440 volts came on again after a power failure, motor M1 would not start up until the push button at the remote control station was depressed again. This voltage contactor is not shown since it does not affect the number of wires between the remote control station and the power station.

With the connection as shown for the indicating light, it will burn every time the push button is depressed, but if CR1 fails to close at the M1 station, it will go out when the button is released. If the other six motors are in line with M1, then the same common return can serve for all six stations, and it would not be necessary to have six return wires coming out from the remote control station, as one would serve for all six.

If it is desired to prevent the lamps from burning due to operating the push button, and only burn when the 440 volt starter actually closes and at the same time not increase the number of wires, it would be possible to accomplish this by means of copper oxide rectifiers. In Fig. No. 2, two rectifiers, R1 and R2, are installed at remote control station and R3 at the M1 station. We have a direct connection through R2 at the control station to CR1 coil, but CR1 will not close because R3 is reversed with respect to R2. However, when the push button is depressed, R1 is in circuit and the direction of its arrow is same as R3 so CR1 will close and cause CR2 also to close. When the button is released, CR1 is de-energized, but CR2 is held in since its auxiliary switch is closed and it will stay in until the stop button is depressed. This will save one wire, but when using a pulsating current in

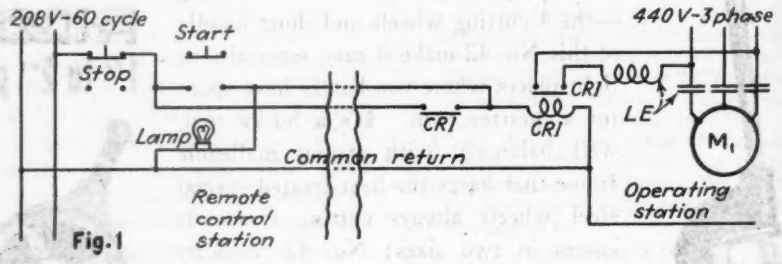


Fig. 1

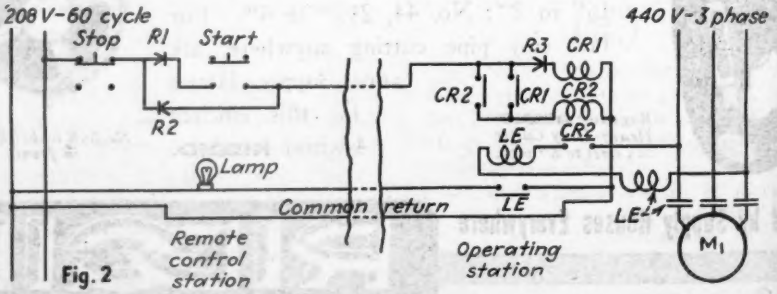


Fig. 2

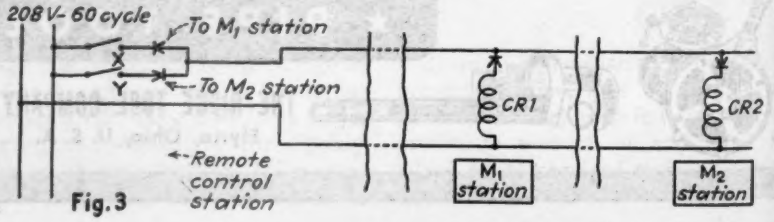


Fig. 3

FOR THOSE "TOUGH JOBS"

WHERE THE SURROUNDING ELEMENTS ARE DESTRUCTIVE OR HAZARDOUS

use Wagner MOTORS

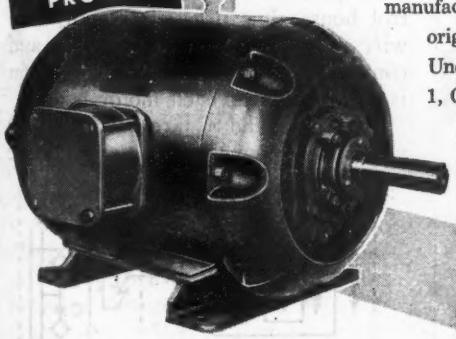
TOTALLY-ENCLOSED

Wagner CP totally-enclosed fan-cooled motors are designed to operate under adverse conditions in atmospheres that contain dust, dirt, abrasives, steel chips, filings, acid fumes, and other harmful elements.

SPLASH-PROOF

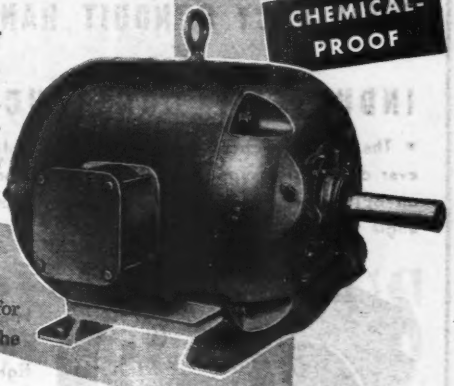
Wagner splash-proof, squirrel-cage polyphase motors are built to operate dependably in locations where they are subject to splashing water, oil, or other liquids. They are widely used in unprotected outdoor locations, being designed with complete self-protection against rain, snow and sleet.

EXPLOSION-PROOF



Wagner explosion-proof polyphase motors are designed to operate in locations where "flammable volatile liquids, highly flammable gases, mixtures or other highly flammable substances are handled or manufactured, used or stored in other than original containers." Approved by the Underwriters' Laboratories for Class 1, Group D hazardous locations.

CHEMICAL-PROOF



Wagner chemical-proof motors are of totally-enclosed, fan-cooled construction and designed to resist the action of acids, fumes, moisture and other harmful elements encountered in chemical manufacturing. A moisture-proof and dust-tight conduit box protects the motor against dust, fumes, or moisture. Special drain plugs in end-plates and conduit box are provided for removing any condensation from the motor or conduit box.

MOTORS
TRANSFORMERS
UNIT SUBSTATIONS
INDUSTRIAL BRAKES
BRAKE LINING

M44-8A

***Write* FOR BULLETINS MU-182 and MU-183**

Everyone interested in electric motors should have Wagner Bulletins MU-182 (Wagner Polyphase Motors) and MU-183 (Wagner Single-Phase, Direct-Current, and Small Polyphase Motors). Helpful information also will be found in Bulletin MU-26A (Instructions for Installing and Operating Wagner Polyphase Motors)

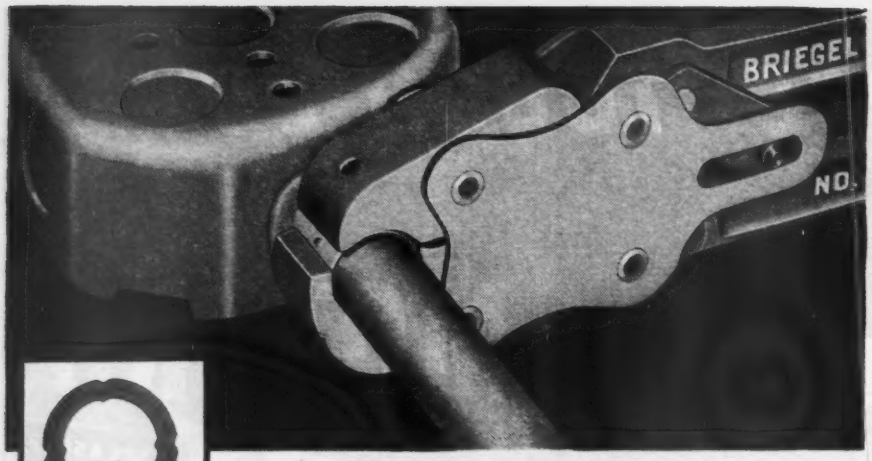
ARMY E NAVY
NATIONAL SECURITY AWARD

Wagner Electric Corporation

ESTABLISHED 1891

6413 Plymouth Avenue, St. Louis 14, Mo., U. S. A.

ELECTRICAL AND AUTOMOTIVE PRODUCTS



Cross section Showing Indentations.

E·M·T UP THE QUICK WAY

Two Squeezes and it's Set

TWO QUICK SQUEEZES give you Finer, Faster Conduit Connections. B-M Fittings do away with the twisting, turning and tightening of nuts and save you valuable time and materials. Then too, they are stronger, neater and much easier to work with in tight places. Start using B-M Fittings today. Have more satisfied customers—more profits from each job!

(All B-M Fittings carry the Underwriters Seal of Approval)

DISTRIBUTED BY

The M. B. Austin Co., Chicago, Ill.
Clayton Mark & Co., Evanston, Ill.
Clifton Conduit Co., Jersey Cy., N. J.
Gen. Electric Co., Bridgeport, Conn.
The Steelduct Co., Youngstown, Ohio
Enameled Metals, Pittsburgh, Penn.
National Enameling & Mfg. Co., Pittsburgh, Pa.
Triangle Conduit & Cable Co., New Brunswick, N. J.

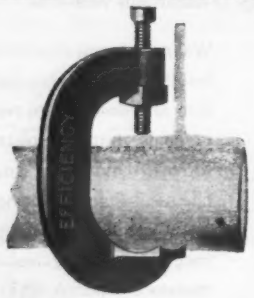
Prompt Deliveries on Properly Rated Orders

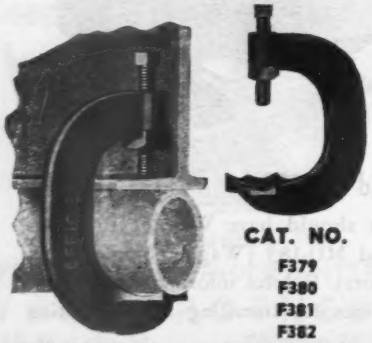
BRIEGEL METHOD TOOL CO. • Galva, Ill.

"EFFICIENCY" DEVICES FOR CONDUIT AND CABLE SUSPENSION

EFFICIENCY CONDUIT HANGERS
for
INDUSTRIAL CONSTRUCTION

• The most practical and widely adaptable hanger ever devised for supporting conduit or armored cable on open steel construction. Will carry pipe at any angle to beam.





Highest grade malleable iron, guaranteed against breakage. Set screw, cup pointed, tightened by free nut, plus 5-point radiating ridges of gripping surface holds pipe on true mechanical principle, guaranteeing a solid, non-slip support.

CAT. NO.	FOR PIPE AND CABLE SIZES
F379	For armored cable
F380	For ½" and ¾" conduit
F381	For 1", 1¼" and 1½" conduit
F382	For 2" and 2½" conduit

WRITE TODAY for our Catalog No. 38 . . . contains complete information on this and other EFFICIENCY Electrical Devices

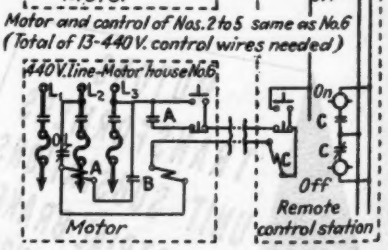
Efficiency
ELECTRIC AND MANUFACTURING CO.

this way the voltage is lower through the rectifiers because only half the wave length is used and CR1 and CR2 coils must be designed accordingly.

A further extension of this scheme could be used as shown in Fig. No. 3, using one control wire for two stations, M1 and M2. It is possible to select the closing of CR1 in station M1 from switch X and CR2 in station M2 by switch Y over a single wire plus a common return wire. However, this arrangement does not provide for undervoltage protection. The relay contactors operated by a rectified current in this way should have a time delay drop-out characteristic because this current is really a pulsating current and an ordinary contactor would tend to chatter due to the current impulses. —R. E.

A. TO QUESTION 151. I would favor using a control scheme similar to that shown in the accompanying sketch. Only the elementary parts of the motor starter and the fundamental wiring are shown. The starter connections would be changed to suit the diagram. The 440 volt line wires would have to be phased out and connected as in the diagram. As shown, the control system contains 13 wires between the motors and the control house. The common supply to the start side of each pushbutton station in the control house thus necessitates only two wires each between motor house and control house. A pushbutton station is also shown at each motor house.

Relays B and C are identical 220 volt relays connected in series, there



being 440 volts across both of them when they are energized. The operation of the system is as follows. When the "start" button is pushed, relays B and C are energized closing the B contact and one C contact, and opening the other C contact. Closing the B contact energizes coil A which is the main starter coil. This closes the A contact and starts the motor. The auxiliary A contact keeps coils B and C energized when the start button is

released. Full starter protection is maintained as the overload contacts open the circuit to all three relays, and, as the voltage on the relays is the same as is on the motors, undervoltage release is provided. The C contacts merely operate the "ON" and "OFF" pilot lights in the control house. Two pilot lights are used to give a more positive indication of motor operation and also of pilot light failure.

Pushing the stop button now de-energizes relays C and B, contacts C de-energize the "ON" pilot light and energizes the "OFF" pilot light, contact B de-energizes coil A which in turn opens the A contacts and de-energizes the motor.

If a cable is used to bring the control wires from the motors to the control house, the wire size will be determined by the size necessary to keep the voltage drop in the circuit containing relays B and C to a maximum amount of five percent or about 22 volts. Relays B and C will be very small as they only have to be rated to handle the current through coil A at a voltage of 440. Consequently the current in the control circuit is small and very small wires can be used. If an overhead line is used for the control circuit the wires will have to be large enough to meet the necessary mechanical strength requirements as well as conductivity requirements.—O. H.

A. TO QUESTION 151. In the remote control of motors, the 6E5 electron-ray tube (Indicator Type) suggests a method that is both control and on-off indicator in one envelope with low current drain. Thus telephone cable or some such conductors may be used, as approximately five milliamps flow in each control circuit.

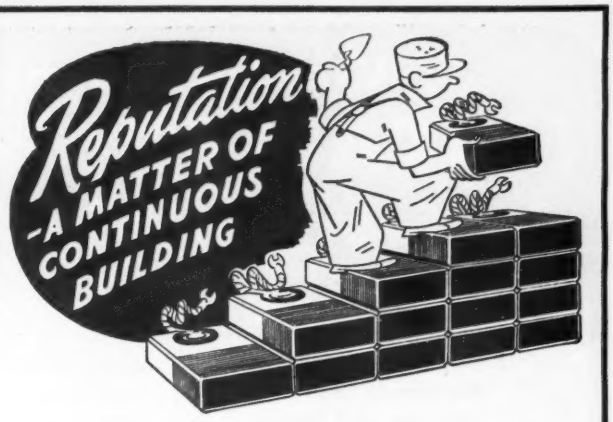
A cathode resistor is used to obtain a negative voltage on control grid and a single pole switch is shunted across the resistor.

When the switch is closed the negative voltage is removed from the grid, the effective voltage is zero, and plate current flows. This flow of current energizes the plate circuit relay which closes the contact energizing the holding coil of the magnetic switch, setting in operation the sequence of the motor controller.

With the switch open, the negative voltage is applied to the grid, which is high enough to block the tube. With the tube blocked no plate current flows. The plate circuit relay is de-energized, opening the holding coil circuit.

The fluorescent screen in the dome of the bulb provides the visible effect of this tube.

When the grid voltage is zero the target-pattern should be approximately 90 degrees. With the full voltage ap-



After 25 years we're still at it, and expect always to be. For reputation-building is a job that's never finished . . . Constant change and improvement rule the electrical industry. These advances are steadily making old practices, old viewpoints, old products, obsolete. Good old Superior brush grades, regardless of how good or how old, have to go when they no longer "deliver". New brushes take their place, stemming from consistent laboratory research and a close study of our customer's needs.

SUPERIOR CARBON PRODUCTS, INC.

Since 1919 SUPERIOR CARBON BRUSHES

9113 George Avenue Cleveland, 5 Ohio

JOHNSON LEADED BRONZE BEARINGS

Compare the installation costs with the purchase price of bearings and you will readily see why quality should be your first consideration. It's the long, trouble-free hours of operation that determines real value. Johnson Electric Motor Bearings are the highest quality possible. They are available from stock for more than 250 motors—either standard size or undersize. Write for our new catalogue.

JOHNSON BRONZE CO.

Sleeve BEARING HEADQUARTERS

490 S. MILL STREET · NEW CASTLE, PA.

Use Dependable
MACALLEN Mica
For Every Electrical Need!

MICA PLATE
Moulding, Segment, Flexible, and Heater
MICA AND FIBERGLAS COMBINED
MICA PAPER
MICA CLOTH
MICA COMMUTATOR RINGS & SEGMENTS
MICA AND ACETATE COMMUTATOR SEGMENTS
MICA AND RED ROPE PAPER
MICA AND FISH PAPER
MICA AND PAPER TAPE
MICA TUBING

Write for the IWI Blue Catalog!

INSULATION AND WIRES SERVICE

All Macallen Mica Products Distributed by
INSULATION and WIRES, INC.
2127 Pine Street, St. Louis 3, Missouri
289 Simpson Street, N. W., Atlanta 3, Georgia
30 Trowbridge Avenue, Detroit 2, Michigan
181 Portland Street, Cambridge 41, Massachusetts
3930 Coleridge, Houston 5, Texas

NEW!
Non-Inductive Conductor Racks

Racks available for any number of cables—cable sizes 5/16" to 2¾".

● Available in types for any number of cables, the M & W Type S-L Conductor Rack is designed so that cables are only partially surrounded by metal. This prevents induced current—permits the rack to be used for A.C. or D.C. systems. Simple design makes for quick, easy mounting of cables.

Write today for Bulletin C-S-51 . . . contains full information on M & W Non-Inductive Cable and Conductor Racks.

M. & W.
ELECTRIC MFG. CO.
EAST PALESTINE OHIO

SPEED UP REA JOBS
with
PAINE ROMEX STRAPS

No. 201-1 Hole

No. 201-2 Hole

With Non-Metallic Sheathed Cable

. . . and PAINE PIPE STRAPS

701

For hanging thick and thin wall Conduit, Pipe and BX. Made of uniform gauge galvanized with rounded edges. Beaded for extra strength.

Guaranteed number of pieces to the pound.

Available in 100 lb. Bags and 5 lb. cartons. Order yours TODAY.

702

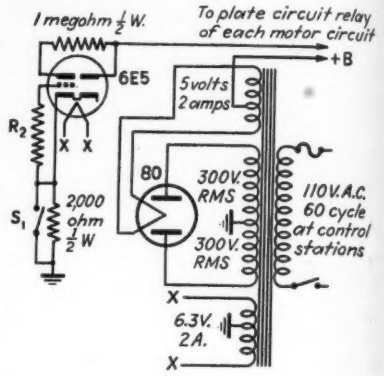
THE PAINE CO.
2961 Carroll Ave. Chicago 12, Ill.
Offices in Principal Cities

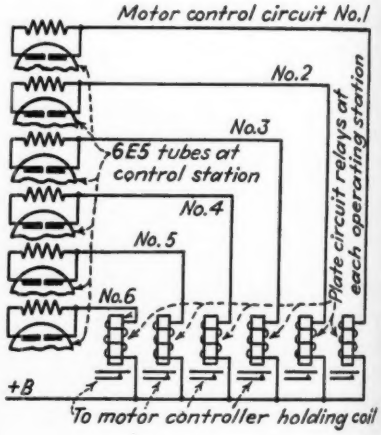
PAINE
FASTENING and HANGING DEVICES

plied to grid, the angle is nearly zero.

The value of the resistor R_2 is determined by trial. With the switches open (switch shunting the cathode resistor), the value of R_2 is varied by the use of a rheostat to obtain correct value. Then a fixed resistor is substituted for permanent installation.

When the rheostat is turned to such a point that the target pattern is nearly





zero degree angle, the rheostat is disconnected and the value of resistance measured.

The angle of the target-pattern should now be approximately 90 degree when the cathode shunting switch is closed.

An unfiltered rectifier using a type 80 tube is used to supply the plate voltage of the 6E5 tubes.—A.C.L.

UNBALANCED CURRENT READINGS

QUESTION 152. We have five 440-volt, 3-phase motors, each drawing unbalanced currents. The high or low values do not occur in the same phases in each case. The following readings were obtained:

75 -hp	58	41	54	*amperes*
35 -hp	36	22	24	*amperes*
35 -hp	23	16	22	*amperes*
20 -hp	13	8	12	*amperes*
7½-hp	3.7	4.1	6.6	*amperes*

Regarding voltage, the regulation is good and the phases are maintained at about 470, 465 and 480 volts. The transformer bank consists of three apparently identical units, connected primary wye with neutral point isolated from common neutral and ground; secondary delta.
What might be the cause of these unbalanced current readings?—J. M. T.

A. TO QUESTION 152. There is a maximum voltage unbalance at the transformers of about 3 percent. This is not alarming and may be in part due to the unbalanced currents taken by the motors.

The current unbalance of the motors ranges from approximately 18 percent to 64 percent. A voltage unbalance would show up in a greater current unbalance. As the magnetic parts reach saturation, the reactance tends to approach a maximum. Consequently, a given percent increase in voltage will result in a much greater percent increase in current.

A suggestion would be to carefully explore the feeders with a voltmeter, searching for a bad connection or a section having conductors of different resistances. This latter may be due to wires of odd sizes or odd lengths as compared to the others. If there happen to be single phase loads taken from the 440 volt feeders, a shifting of these may alleviate the condition. When making these tests, also try disconnecting first one motor then another. One may have a damaged winding that is causing all the unbalancing to the feeders, which in turn is affecting all the other motors.—L. E. B.

Can you ANSWER these QUESTIONS

QUESTION W6—We have three-100 kva. single phase transformers, 7200 volts primary, and 460/230 volts secondary, delta-delta connected into a three phase bank, and at the present time they are carrying a load of about 150 kva. at 460 volts, which is an induction motor load.

We wish to add more induction motor load to these transformers at 230 volts, as 23 volt auto-starting compensators are the only starting equipment available.

How much additional load in kva. can we add to these transformers without over loading them? How can it be calculated? —L.H.M.

QUESTION X6—I have a three hp., 220 volt, 60 cycle, three phase squirrel cage induction motor, the stator of which has a multi-speed (variable torque) connection. When the motor is running on the four

—a new FULLY ADJUSTABLE Threader for pipe up to ¾" and bolts up to 1". *Write for Catalog 44*

BEAVER PIPE TOOLS INC.

1142 DEEN AVENUE WARREN, OHIO

INSTALL TRICO

POWDER-PACKED

RENEWABLE FUSES

For these PERFORMANCE FEATURES:

Dependability — The self contained *powder-packed* renewal element eliminates all chances for mistake—always safe—dependable. Fuse link is carefully protected against damage.

Tamper-proof protection. Stops dangerous and vicious practice of "doubling up" fuse links.

Non-interchangeable construction—prevents the inefficient practice of substituting *ordinary* bare links.

Link support—the powder-packing prevents sagging and stretching of fuse link—stops premature blowings.

Safe Time-Lag—Not over-done—prevents early deterioration of motors and windings.

Life-time Casings—All blowing action is confined to the inner renewal casing. No cleaning, scraping or replacing of parts necessary.

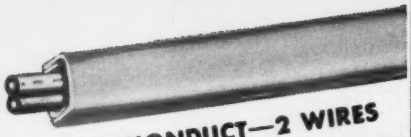
Self-aligning—Flexible blades make perfect contact with fuse clips.

Simplicity—Remove only one cap—no loose washers—no time wasted.

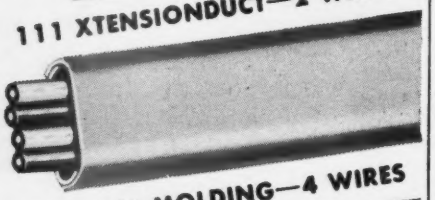
TRICO "Powder-Packed" FUSES COST NO MORE!

TRICO FUSE MFG. CO. Milwaukee Wisconsin FUSES

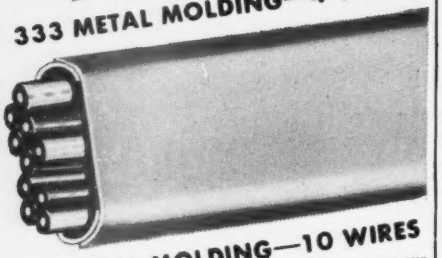
Simply on the surface



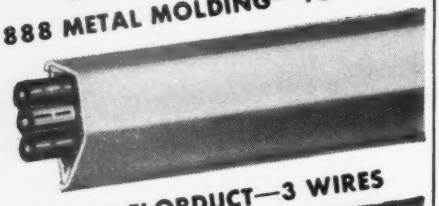
111 XTENSIONDUCT—2 WIRES



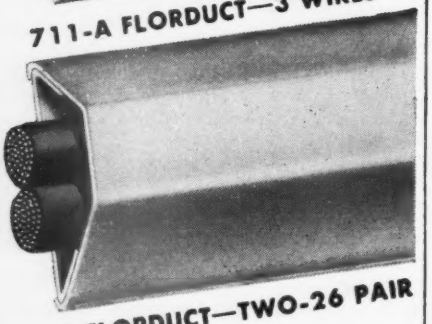
333 METAL MOLDING—4 WIRES



888 METAL MOLDING—10 WIRES



711-A FLORDUCT—3 WIRES



733-A FLORDUCT—TWO-26 PAIR

National Electric Surface Raceways for surface wiring are easily installed. They have a neat appearance and may be painted with either oil or water paints to match interiors. These raceways are securely fastened to all fittings. No screw connections necessary. Push tongue connection insures perfect permanent ground. Wires are laid in the base; the capping snaps on. No fishing or tearing up walls or floors.

Write for descriptive literature on "La-in" surface raceways.

Listed and approved by Underwriters' Laboratories, Inc.

National Electric Products Corp.
Pittsburgh, Pa.

pole connection (series star), I can switch the connection to the two pole connection (parallel star) at the same time reversing two line leads. The result is that the motor will come to an immediate stop and then build up its speed on the two pole connection in the reverse direction.

This is all very satisfactory, but when I have the motor operating on the two pole connection and try reversing two line leads and at the same time switch to the four pole connection, the motor simply runs at a very slow speed without reversing its direction of rotation.

Would someone explain this effect and what might be done to correct it?—L.J.M.

QUESTION Y6—We have installed in an army camp laundry sixteen 1½ horsepower squirrel cage induction motors, each of which is direct connected for exhaust fan duty. The motors are 220 volts, 3-phase, 60 cycle. They are supplied with 3-phase, 208 volts, 60 cycle current. Will the supplied voltage damage the motors and what effect will it have on the slip and torque of the motors?—G.R.G.

QUESTION 26—We wish to make a temporary installation of some primary expulsion cutouts on a 4160 volt system which is fed from two banks of 4000 kva. each in parallel connected delta-wye. The impedance of the transformers is five percent and their ratio is 11,000 to 4160 volts.

What we want to know is, what is the formulae for determining the r.m.s. value or the rating in kva. which the main fused disconnects will have to be capable of rupturing under fault conditions?

We are considering using 15 dropout type cutouts behind the main switch on the five individual sub feeds. However, we fear they may be completely shattered under fault and therefore constitute a hazard.—G.S.E.

QUESTION A7—In one of our chemical processes considerable quantities of ether are used and the resulting fumes present a serious explosion hazard in spite of the fact we have ample ventilation and the best of explosion-proof wiring. Our problem revolves about the question of static electric charges that develop through the scuffing of many shoes on the linoleum floor covering. The answer is quite obvious for those persons who are permanent employees of the department—they wear shoes with conductive soles. It is the outside help that comes in for short periods that cannot all be required to wear special shoes. We plan on installing static grounding devices at the doors such as is common practice in explosive production plants; however, we do urgently need some information on the special type of floor dressings that are presumed to eliminate static charges. Can some one suggest a solution?—P.C.Z.

PLEASE SEND IN YOUR ANSWERS BY DECEMBER 1

TRIPLOC plugs and receptacles

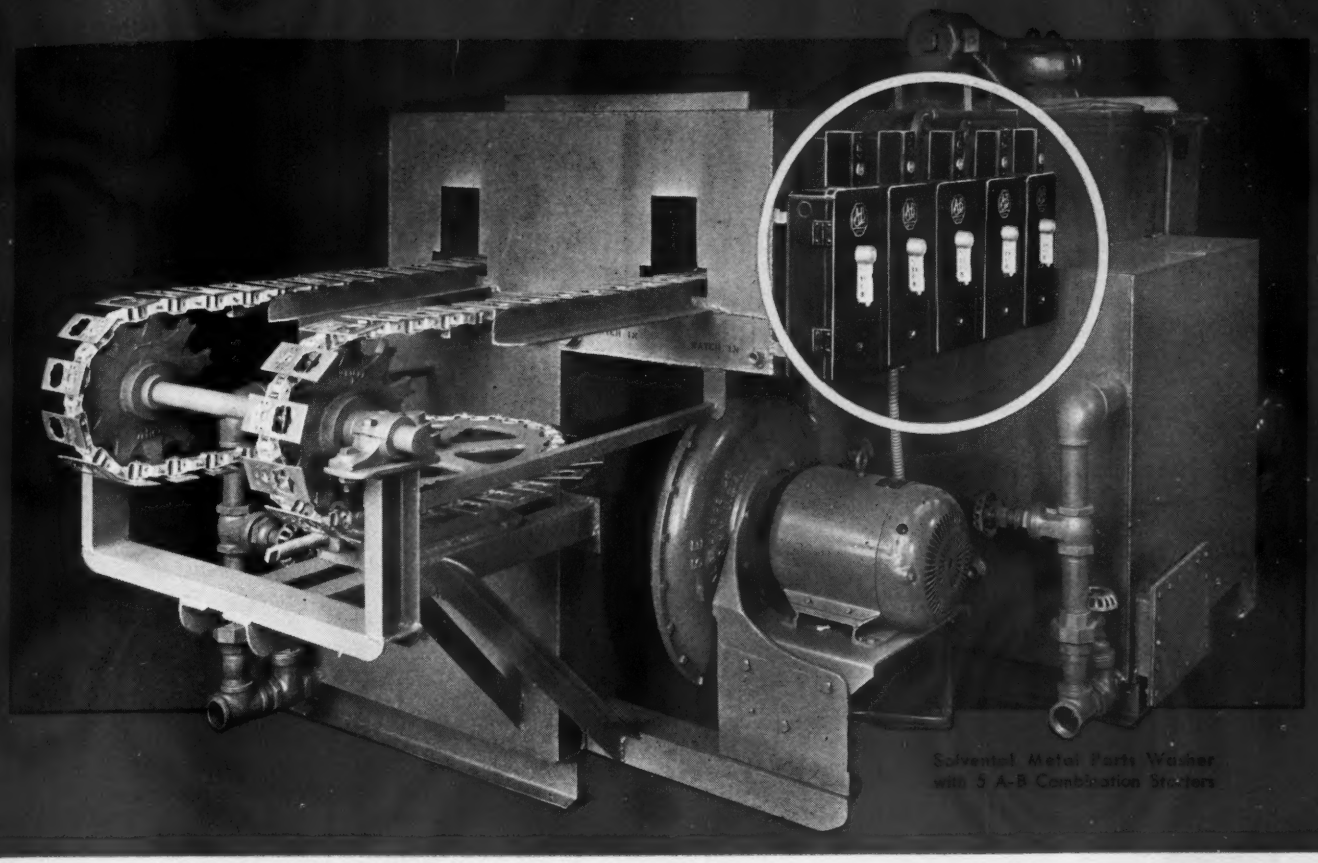
1, 2, 3, 4, 6, 8 pole interchangeable contact units

Interchangeable contact units, 1 to 8 poles, can be assembled in standard plug shells and receptacle housings to make any desired unit to meet individual requirements for any portable electrical equipment. The protected female contact unit can be assembled in either plug or receptacle for safety in the line side of the circuit. Fusible types and units with one pole grounded are also available.

Automatic bayonet lock with either manual or combination manual and automatic release protects equipment and wiring. Wide range of plug shells, receptacles, and cord connectors available in the complete Triploc line, ratings up to 20 amperes, 250 volts D.C., 460 A.C. Write for Pylet catalog giving complete listings.

●

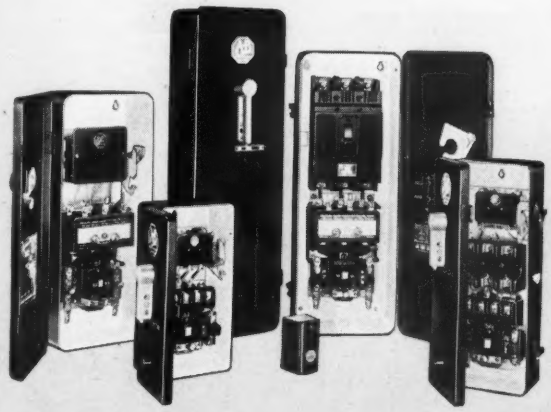
THE PYLE-NATIONAL COMPANY
1344 N. Kostner Avenue, Chicago 51, Illinois



Solventol Metal Parts Washer with 5 A-B Combination Starters

Save Space—Save Wiring—Save Trouble

with A-B Front-Operated Combination Starters

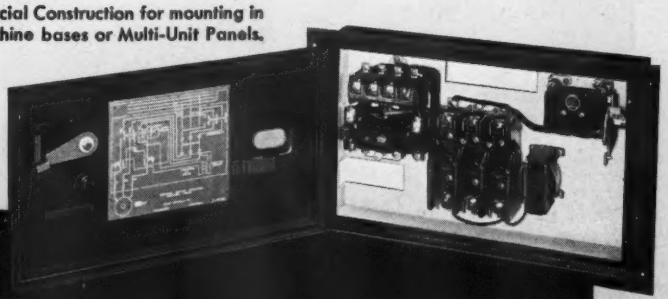


A-B Bulletin 712 and 713 Combination Starters

Across-the-line starter and disconnect unit in one cabinet . . . silver alloy contacts on both starter and disconnect switch . . . front-operated disconnect lever . . . these are only a few advantages of Allen-Bradley Bulletin 712 Combination Starters. Available in a variety of enclosures to fit any application.

Write for Bulletin 712 describing these compact solenoid combination starters. They save space, wiring, time, and trouble . . . and they provide added safety, too.

Special Construction for mounting in machine bases or Multi-Unit Panels.



ALLEN-BRADLEY

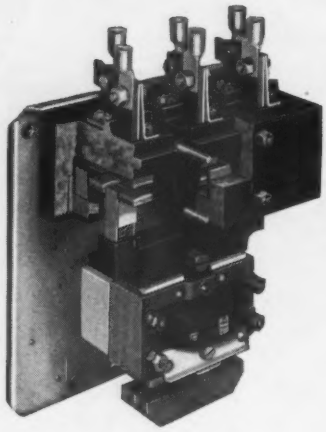
COMBINATION SOLENOID STARTERS

Big or Small

all Bulletin 709 Starters are Solenoid-Operated

The five Allen-Bradley Bulletin 709 solenoid starters, shown below, have been making notable control history for the past ten years.

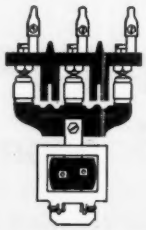
The first starter, introduced in 1934, was Size 1 for 5 hp., 220 v., 7½ hp., 440-550-600 v. It smashed all performance records of clapper switch starters and, for the first time, made possible precision motor control for machine tools. It set the pattern for modern motor control design and performance.



Sectional view of 150 ampere Bulletin 709 starter showing solenoid plunger, contacts, and terminals, all mounted on steel plate.

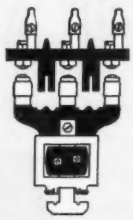
Since then, four more sizes have followed, extending the Bulletin 709 line up to 50 hp., 220 v., and 100 hp., 440-550-600 v. In all sizes, the highly successful Allen-Bradley solenoid principle is used. Only one moving part . . . no pins . . . no pivots, hinges, or bearings . . . no contact maintenance . . . no variation in switching performance. No starter is so simple . . . nor so trouble-free.

Unfailing dependability and accuracy in opening and closing of circuits are essentials in machine tool control . . . and Bulletin 709 starters meet these requirements under all service conditions. It will pay you to standardize on A-B controls.



Contacts closed

Only ONE Moving Part



Contacts opened

Allen-Bradley Company
1316 S. Second St., Milwaukee 4, Wis.

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

IN THE NEWS

2200 ATTEND CHICAGO ELECTRONICS CONFERENCE

Electronics, shed of all the glamor and mystery prone to surround it of late and stripped down to a basic fundamental theoretical and practical presentation, drew one of the largest audiences ever to attend a technical clinic in this area. Some 2200 scientists, engineers and educators throughout the U. S. and even some from Canada, Mexico, South America and Great Britian, packed the Medinah Club of Chicago at the first National Electronics Conference, October 5 to 7.

Sponsored by the Illinois Institute of Technology, Northwestern University, and the Chicago Sections of the Institute of Radio Engineers and the A.I.E.E. with the cooperation of the Chicago Technical Societies Council, this initial national forum presented a program of 16 subject sessions with 50 papers ranging from theory to practical applications of electronics in the fields of mass entertainment, communications, medicine, power and industrial control and processing.

Opening the general session, Ralph R. Beal, research director, Radio Corporation of America, pictured electronics as one of the most striking of wartime technologies and pointed out that a science so effective in war could be used much more effectively in peace. Reiterating that electronic research has opened vast new frontiers for development and application, he urged research and more research as the order of our postwar world.

With electronics being considered one of the hopeful influences to help maintain a high rate of postwar industrial activity, new applications for industry must be developed rapidly, W. C. White, director of Electronics Laboratory, General Electric Company, told the guests at a conference luncheon. Under the impetus of war, the development period has been cut drastically in the case of electronic devices for military use, he added, concluding that some of the wartime speeding-up will continue on into the postwar era. However, he cautioned, in postwar development we must be certain that applications are economical and successful to attain and hold public acceptance.

At the session devoted to electronics in the power field, A. C. Monteith and C. F. Wagner, Westinghouse, segregated the applications into two categories—power and control purposes. Of approximately 3,300,000 kilowatts of rectifier capacity at present installed in the U. S., 2,200,000 are of the ignitron type (preferred method of obtaining d-c power at voltages of from 250 to 3000) the paper revealed. Developments incidental to the design of three electronic frequency changers now installed in the U. S. will be useful as a benchmark in the economic study of d-c transmission, it was asserted. Present indications are that power blocks of 300,000 kilowatts and transmission distances of at least 300 miles must be considered before competition with a-c transmission can be contemplated. The paper went on to discuss various control devices that solve the more difficult industrial plant control problems electronically.

G. F. Jones and J. A. Cox, Westinghouse, evaluated the application of rectifiers and inverters in the power field. This method of conversion is finding greater acceptance because of higher efficiency, greater reliability, lower maintenance and general lower installed cost, it was revealed.

In a review of electronic motor control, B. J. Dalton, General Electric Company, stated that adjustable voltage and automatic control for shuntwound d-c motors can easily be obtained from a grid-controlled rectifier supplied by single or polyphase a-c source; that controlled reversing and stopping by inversion (by grid control in conjunction with customary reversing contactors) is practical. Although 25 hp. is near the feasible upper limit for a power supply using hot cathode rectifiers, tests as well as foreign operating experience have shown successful use of ignitron rectifiers to supply and control larger d-c motors, he added, noting that growth in this phase might be slow because of the competition of the m-g set. Functions, speeds, responses and accuracies otherwise impossible are now practical in many processes through electronic control, he concluded.

One entire subject session dealt with High Frequency Heating of both the dielectric and inductive types. Speaking before the industrial electronics forum, M. J. Maiers, Commonwealth Edison Company, presented the result of a survey made in the field of high frequency dielectric heating. Outlining this method of heating by placing the material between the plates of a condenser of an oscillating circuit designed for a frequency of 3 to 30 megacycles with the necessary potential to provide the heating of material (brought about by molecular hyster-

"You ought to be ashamed of yourself. Sending this little thing out to pick up some lugs!"

esis caused by the high frequency electrostatic field), Mr. Maiers went on to reveal that economic applications and extensive research have been made in the food, laminated wood, furniture, plastic, textile, paper and rubber fields.

In a paper on high frequency heating of conductors and non-conductors, C. J. Madsen and R. M. Baker, Westinghouse, discussed practical factors which affect the application of high frequency technique to industrial problems—such as resistance, loss factor, size of load being heated and current and voltage in the load circuit components. Inductive heating applications require considerable development work with the parts to be heated and details of coil design which cannot be determined from calculation alone, it was asserted. This heating method is a useful tool when properly applied, but problems must be carefully studied to avoid mis-application, they concluded.

The use of radio frequencies makes possible the application of power to metal objects in concentrations up to 100 kw. per sq. in.—amounting to 20,000 kw. per cubic inch under favorable conditions, stated Dr. Wesley Roberds, Radio Corp. of America, in addressing the high frequency heating section. Such concentrations are obtained with the use of electronic generators with output powers up to 200 kw. at 400 kilocycles, he continued, the generator being coupled to the work through a current transformer and a single turn inductor loop. The thicker the work, the greater is the advantage of radio frequency heating methods, he added, while discussing the optimum performance of such methods.

Increased efficiency and greater effectiveness in high frequency heating can be obtained if generators are designed to deliver a constant rated power to a varying load, asserted Dr. Eugene Mittlemann, Illinois Tool Works, in a paper outlining means of achieving that end by appropriate impedance matching methods. Describing both induction and dielectric heating generators up to 20 kw. useful high frequency output, he went on to cite practical examples which demonstrated that generators of smaller ratings could be used if the rematching principle was considered.

Addressing a session on electronic measurements and controls, Theodore A. Cohen, Wheelco, Instruments Co., revealed that simplification of many types of automatic control devices has been possible through the use of electronic mechanisms. Continuing, he treated the subject from an analytical viewpoint with emphasis on the development of a new relaying mechanism which eliminates measuring error normally caused by the relaying portion of such devices.

Extending the discussion in this category, H. D. Middel, General Electric Co., outlined the application of electronics to the measurement and control of process variables. Reviewing the operating capabilities and design factors involved in the application of relays to electronic circuits, R. H. Herrick, Automatic Electric Company, gave special attention to such lesser-known and often unrecognized design factors as relay coil resistance, inductance and associated capacity on operation and release speed and on tube performance.

Several types of electronic instruments for use in industrial inspection problems were outlined at the conference. The inspection of interior metal parts by means of sound waves was discussed by Dr. F. A. Firestone, University of Michigan, who outlined the operation and application of the Supersonic Reflectoscope. Revealing that a joint service-industry program of standardization and specification of cathode-ray tubes has resulted in improved performance and uniformity of production, Dr. P. S. Christaldi, Allen B. DuMont Laboratories, discussed such application as testing for vibration, balance, speed, electrical circuits and components, optical problems and non-destructive testing of many metals. The application of the Mass Spectrometer in the oil and chemical industries was discussed by Dr. J. A. Hipple, Westinghouse, who outlined in detail a fast pen recording system developed for this application.

A two million volt, mobile, X-Ray unit embodying the novel features of the million volt therapeutic and the million volt industrial units was described by Dr. E. E. Charlton and W. F. Westendorp, General Electric Co., at the Industrial Radiography session. The possibility of using fluoroscopy for X-ray inspection of light metals to relieve radiography of part of its burden in industry was discussed by Dr. Scott W. Smith, Kelley-Koett Mfg. Co. with specific emphasis on the factors limiting sensitivity from the standpoint of image and viewing. The use of an electron source utilizing field emission from a cold cathode electrode in a high vacuum to provide currents of 2000 to 3000 amperes for making ultra-speed radiographs using exposure times of the order of one micro-second was discussed in a paper presented by Dr. C. M. Slack, Westinghouse and E. R. Thilo, Frankford Arsenal. With the chief wartime use in ballistics research; the possible postwar uses were listed as analysis of rapidly moving parts of machinery where distortion or displacement of enclosed parts is suspected and inspection of parts on continuously moving conveyor belts and similar applications.

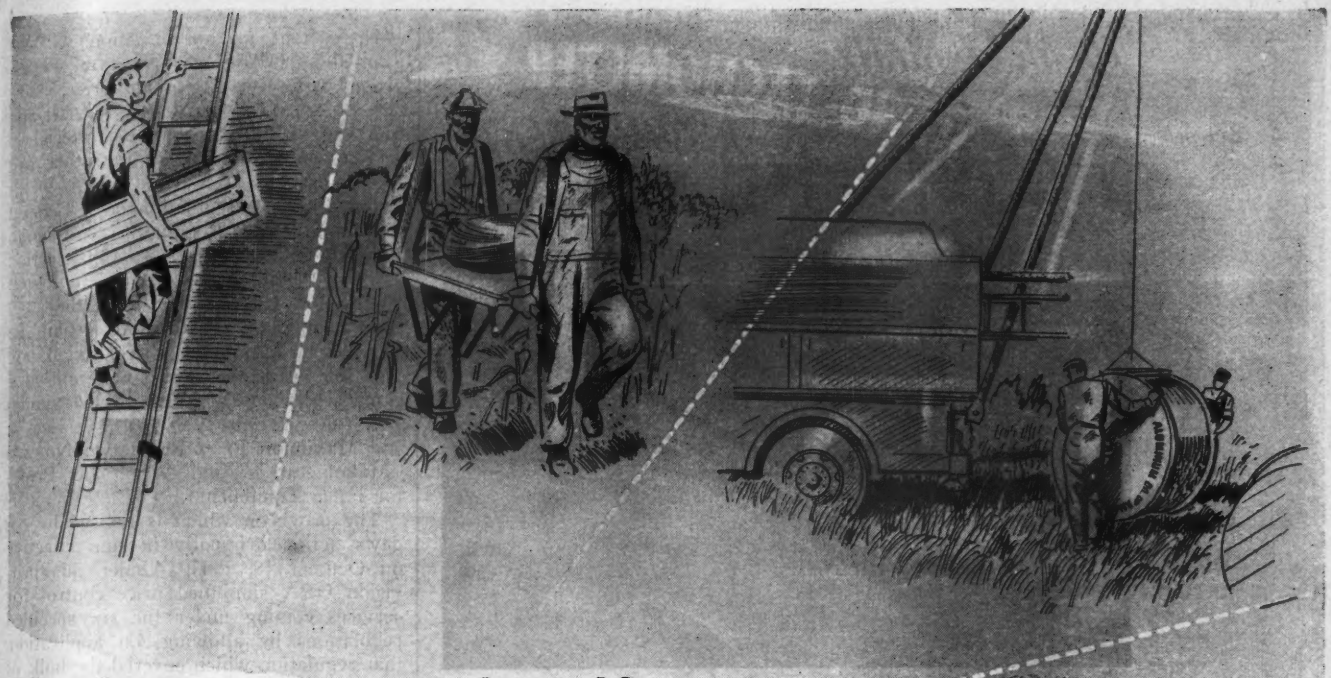
C. LYNN—author of a September issue Motor Shop article, "Compensating Windings on D-C Motors and Generators" which was inadvertently credited incorrectly. Mr. Lynn is manager of the D-C Generator Engineering Department of the Westinghouse Electric and Manufacturing Company. Following graduation from the University of Kansas in Electrical Engineering and after completion of the Westinghouse training course, Mr. Lynn served a year in special training under B. G. Lamme, then chief engineer. Since that time he has devoted his energies and skill to D-C design of large specialized apparatus.

ACTIVE IN THE ILLUMINATION FIELD are (L to R) Geo. C. Mittauer, Fostoria Industrial Service, Omaha, Neb.; Fenn C. Horton, G. E. Lamp Dept., Davenport, Iowa; E. A. Holloway, Iowa Electric Power Co., Cedar Rapids; and R. R. Robinson, Colonial Premier Co., Chicago; seen relaxing after a heavy session at the recent I.E.S. Technical Conference in Chicago.

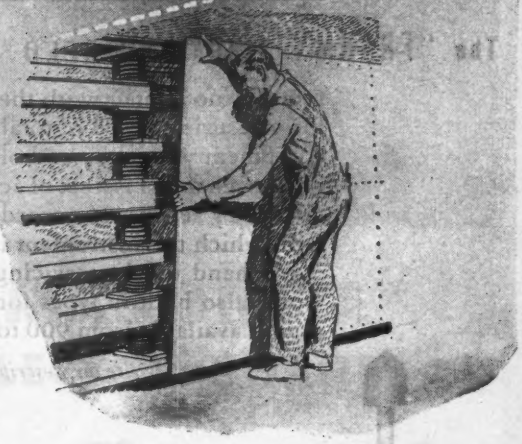
REVISED SUPPLEMENTARY ORDER 76

One exception to the existing provision that suppliers of services whose ceilings are established by more than one of six specified regulations may apply for authority to determine their ceilings by using only one of the regulations as recently announced by the Office of Price Administration.

This exception, effective October 10,



Aluminum cuts costs by taking the *Grunt* out of labor



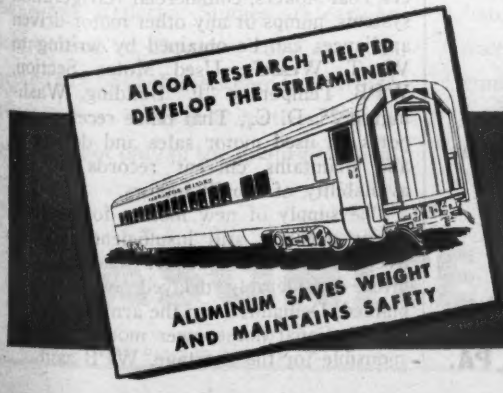
Weight-saving aluminum reduces the labor that has to be expended to do a job. Equipment manufacturers and employers are finding it increasingly important to bear this fact in mind.

The lighter weight of Aluminum Cable Steel Reinforced means that full reels weigh less. Handling from storeroom to the job is easier. With A.C.S.R., there's less weight to be maneuvered into place on poles and towers, so that work goes faster. Lines cost less.

The lighter weight of aluminum bus bars, housings, conduit, Alzak* Aluminum light reflectors, offers identical advantages; easier delivery to the job, faster erection, and lower costs all along the line. Doubtless, many electrical devices could similarly be made labor savers by cutting their weight.

Winning the war comes first, but aluminum is now being used for other-than-war purposes as the manpower situation permits. Our representative will be glad to discuss the availability of aluminum with you. ALUMINUM COMPANY OF AMERICA, 1946 Gulf Building, Pittsburgh 19, Pa.

*Registered trade mark



ALCOA A·C·S·R

The "FRAHM" VIBRATING-REED HAND TACHOMETER . . .

requires no contact with the rotating element and is unique for measuring speed of totally enclosed machines and other equipment where the end of the shaft is not accessible. The only mechanism is a set of accurately tuned steel reeds which vibrate by resonance according to the speed of the machine with which the instrument is held in contact.

For hand use in servicing, installation and maintenance work; also built in types for permanent mounting. Various ranges available from 900 to 30,000 r.p.m.

Write for descriptive Bulletin 1590-EC.

The JONES HEAVY DUTY HAND TACHOMETER

is used for indicating r.p.m. and surface speeds of all types of machinery in which the moving parts are readily accessible. Simple, rugged and reliable, it is built to maintain accuracy in hard, everyday service. Single and triple range models up to 12,000 r.p.m. supplied complete with carrying case and accessories.

Write for descriptive Bulletin 1710-EC.

. . . The JAEGER SPEED INDICATOR

is a "vest-pocket" speed-measuring device which adds up the number of revolutions over a period of six seconds and shows the revolutions per minute without any calculations. Can also be used to measure speeds in feet per minute. Available in two models—for all speeds up to 2000 r.p.m. and for all speeds up to 10,000 r.p.m. Supplied complete with carrying case and accessories.

Write for descriptive Bulletin 1750-EC.

JAMES G. BIDDLE CO. **1211-13 ARCH STREET PHILADELPHIA 7, PA.**

1944, is that no authorization will be granted by OPA for application of provisions of Revised Maximum Price Regulation No. 251—Construction Services and Sales of Installed Building Materials—services subject to any of the other five regulations.

The other five regulations are: General Maximum Price Regulation; Maximum Price Regulation No. 134 (Construction and Road Maintenance Equipment Rental Prices and Charges for Operating and Maintenance or Repair and Rebuilding Services); Maximum Price Regulation No. 136 (Machines and Parts and Machinery Services); Revised Maximum Price Regulation No. 165 (Services); and Maximum Price Regulation No. 246 (Manufacturers' and Wholesale Prices for Farm Equipment).

The provision which is revised by today's action originally became effective on October 18, 1943. Under this provision OPA simplified price control for services coming under the six specified regulations by allowing, on application, that regulation which covered the bulk of the applicant's services to apply to all his services.

It will still be possible for services under Revised Maximum Price Regulation 251 to have ceilings determined by use of the provisions in one of the other five regulations, upon written authority of OPA. The price agency pointed out, however, that as a result of a recent revision of Revised Maximum Price Regulation 251, its use for services covered by the other five regulations would not be consistent with the requirements of the Price Control Act.

Revised Supplementary Order 76—Permission for Service Suppliers Subject to Certain Price Regulation to Apply the Provisions of the One Price Regulation to Services Supplied by Him—effective October 19, 1944.

REBUILT MOTORS AVAILABLE

Repair shops needing standard model, rebuilt fractional horsepower motors for replacement purposes may obtain information from the War Production Board regarding the acquisition of such motors, WPB's Electrical and Mechanical Repair Sections has announced.

Information regarding the acquisition of rebuilt motors for repairing domestic refrigerators, washing machines, oil burners, coal stokers, commercial refrigeration systems, pumps or any other motor-driven appliances can be obtained by writing to W. T. Wessels, Used Motor Section, WPB, Temporary "E" Building, Washington 25, D. C. That office receives reports on used motor sales and deliveries and maintains current records of the availability of rebuilt motors.

The supply of new motors for civilian repair needs is still insufficient and deliveries of those that are available are often considerably delayed, officials explained. Demands from the armed services for fractional horsepower motors are responsible for the shortage, WPB said.

19 Miles of MASONITE* REFLECTOR SHAPES

Help DOUGLAS Build the Skymaster!

YES, 19 miles of them . . . or over 20,000 five-foot reflector shapes in the vast Chicago plant of Douglas Aircraft Co. Here the C-54 *Skymaster* is born, a giant four-motored plane that carries troops and cargo everywhere along the Army's world-wide air routes.

Over 20,000 reflectors . . . *and not one has had to be replaced because of construction failure!*

Masonite Reflector Shapes are easy to keep clean. At Douglas, they are subjected to a bath of live steam from which they emerge shiny and spotless. That's evidence not only of the quality of finish used by the fabricator, but of the bonding power inherent in Masonite's dense, durable material.

These new semi-plastic fixtures are light in weight, thereby cutting shipping costs. They're easy to install. They resist moisture and have a low electrical conductivity. They are non-scaling and will not rust.

Get acquainted with the new leader of the "Light Brigade"—the money-saving hardboard reflector that's fast winning acceptance throughout industry. For complete details write Masonite Corporation, 111 West Washington Street, Chicago, Illinois.

View from platform showing dismantled Masonite Reflectors being lowered to floor for cleaning with live steam.

MASONITE CORPORATION

*"Masonite" is a trade-mark registered in the U.S. Pat. Off., and signifies that Masonite Corporation is the source of the product.

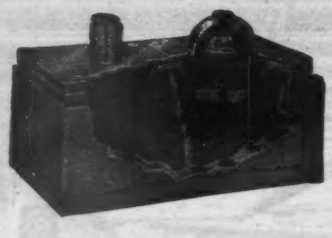
Reg. U. S. Pat. Office

COPYRIGHT, 1944, MASONITE CORP.

FLOOR BOXES

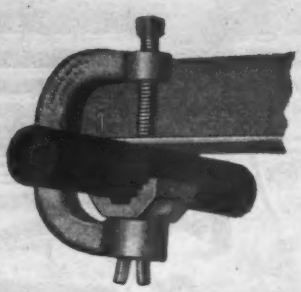
LATROBE PRODUCTS

WIRING SPECIALTIES



NO. 252R TWO GANG BOX

Two gang adjustable Floor Box. No. 208 Receptacle in one section. One cover plate has ½ in. flush brass plug and one has 2" flush brass plug.



NO. 470 "BULL DOG" PIPE OR CONDUIT HANGER

Convenient and highly efficient for hanging pipe or conduit (½", ¾" and 1") to steel beams up to ⅜" thick —or for use as ground clamp.

EASY TO INSTALL — DEPENDABLE

Reconversion for peacetime production will require the same speed and thoroughness experienced in war emergency construction — and again the factors of speed, efficiency and labor saving point unerringly to Latrobe Products. Yes, Latrobe Products have the call for all industrial and commercial as well as residential jobs.

NO. 285 "LATROBE" DOUBLE DUPLEX RECEPTACLE NOZZLE

Shown with No. 200 Cover Plate. Compact, efficient and easy to install.

NO. 280 NOZZLE

Shown with No. 200 Cover Plate. Ten Amp. 250 Volt Receptacle.

"BULL DOG" BX CABLE STAPLES

True "Latrobe" quality is built into these handy little staples. Supplied in cartons, kegs and barrels.

"BULLDOG" INSULATOR SUPPORT

With this convenient support porcelain or glass insulators may be fastened quickly and securely to exposed steel framework without punching holes.

QUALITY

FULLMAN MANUFACTURING CO. LATROBE, PA.

ALWAYS

ORDER L-212 REVOKED

The War Production Board has revoked Order L-212 as of October 19, which controlled the manufacture and distribution of incandescent lighting fixtures. Only a small increase in production is expected to result from the revocation, WPB said.

Order L-212, originally issued in March 1943, was designed to conserve critical materials and to limit the production and sale of new incandescent lighting fixtures except for war plants, war housing and essential civilian installations. As most recently amended (August 1944) manufacturing restrictions limiting the amount of metal that could be used affected only residential type fixtures. Nonresidential types could be sold only on rated orders, but residential types could be sold without ratings.

Production of incandescent lighting fixtures will still be limited by allotments of controlled materials, and by availability of labor, shipping cartons, and components, such as sockets, copper wire, and glass, WPB officials said. It is estimated that an increase in production of not more than 20 percent over present rate will result from revocation of L-212.

The use of copper in incandescent lighting fixtures is restricted by Order M-9-c. As amended October 13, 1944, Order M-9-c now permits copper products or copper base alloy products for plating of lighting fixtures.

The revocation does not mean that nonindustrial types of portable electric lamps and shades are freed from restrictions, since these types are still controlled by Order L-33, officials explained.

Schedule I to P-55-c, War Housing Critical List, amended October 17 lists under Item 370 "Lighting Fixtures—as available."

This means that fluorescent lighting fixtures now held in inventory may be used in war housing construction approved under Order P-55-c. Fluorescent lighting fixtures were prohibited in such construction previous to the October 17, 1944 amendment.

EASTERN INSPECTORS WANT NON-TAMPERABLE FUSES

Reported by **J. M. Turnbull**

Inspectors are prepared to accept about one half of the emergency materials and methods developed to meet wartime conditions according to questionnaire returns presented to the Albany, New York meeting of the Eastern Section, International Association of Electrical Inspectors. The 20th annual meeting was attended by 275 electrical inspectors, their business associates and friends.

Called to order by local chairman E. C. Dalrymple, the delegates were welcomed by acting mayor Frank S. Harris, and past president William J. Mahan responded to the welcome.

The meeting was dedicated to Joseph Henry, born in Albany in 1799, who discovered the principle of self-induction, and

A ROLL OF SECURITY FRICTION TAPE is just about as important to a good shop repair man as a pair of pliers or a screw driver. Whenever or wherever an emergency bobs up involving electrical connections, "Security" can be counted on to do the job fast, and do it right.

Listen to the Philharmonic-Symphony program over the CBS network Sunday afternoon, 3:00 to 4:30, E.W.T. Carl Van Doren and a guest star present an interlude of historical significance.

UNITED STATES RUBBER COMPANY

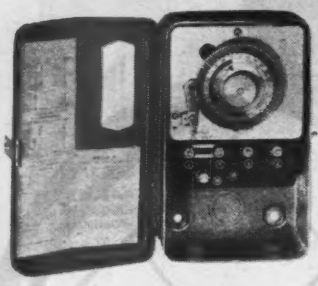
1230 Sixth Avenue • Rockefeller Center • New York 20, N. Y. • In Canada: Dominion Rubber Co., Ltd.

SERVING THROUGH SCIENCE

"TOPS" AS A GOOD WILL BUILDER

Mr. Tops, the Paragon symbol of quality

Paragon time switches and industrial timers win friends and satisfy customers. They insure top quality installations. Use them on your next job.



300 Series

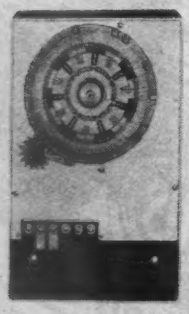
Only $13.00 *List*

300 Series self-lubricating time switches are accurate and durable for controlling stokers, oil burners, blowers, pumps, valves, air conditioning, etc. America's leading time switch value.

800 Series

Time Delay Relays

The time cycle of Paragon synchronous motor operated, instantaneous reset, type relays is unaffected by vibration or changes in ambient temperature. For motor and tube protection.



700 Series

7-Day Time Switches

. . . are designed for presetting heating or ventilating schedules on a weekly basis with independent daily operations.

Manually Preset Timers

The 2500 series is designed to close or open a circuit at the end of a preset interval, such as attic fan control.

Send for complete bulletin. All these units are designed and built by a pioneer in the automatic timing field.

2500 Series

PARAGON ELECTRIC COMPANY
710 OLD COLONY BUILDING
CHICAGO 5, ILLINOIS

Paragon Chicago
BUILDERS OF ELECTRICAL EQUIPMENT SINCE 1905

who served many years as the first secretary of the Smithsonian Institution. Philip J. Gallacher, Commissioner of Buildings, Albany, N. Y., gave a discourse on the work and life of Joseph Henry.

Eastern Section President C. A. Ward of Paterson, N. J., in his address pointed out that the industry had fortunately been based originally on safety and not upon cheapness, and stressed to the stewards of Codemaking their obligation to satisfy the public demand for protective inspection. Inspectors favor a maximum of written specifications and a minimum need to resort to personal opinion according to Mr. Ward.

Secretary F. N. M. Squires reported a busy year with greater interest in the work of I. A. E. I., this being reflected in increased membership. Treasurer Allen W. Hopkin's report showed a prosperous financial position.

The damaging effect of poor and inadequate wartime wiring caused by lack of material and depleted inspection staffs were cited by J. D. Lynett, supervising chief inspector of New York City and international president, who urged inspectors and the industry to follow the I. A. E. I. slogan of 'Let the Code Decide' and not as some would have it to let the code slide. President Lynett felt that the I. A. E. I. had grown to manhood and accordingly should become self-supporting.

The early-morning Code Chats which took place before the regular sessions were well attended, the discussion leaders being B. A. McDonald, John M. Turnbull and Merwin M. Brandon. These informal talks brought out the peculiar needs of inspection of custom-built infrared ovens and made it apparent that inspectors will welcome code recognition and regulation of this new development. The feeder demand factors of the Code were thought to be generally ample although some questioned their adequacy to cover the electrical capacities expected to arise postwar. The pros and cons of insulation versus grounding of farm equipment and appliances was the subject of a lively discussion on rural electrification. H. G. Knoderer stressed the importance of inspection to the farmer and of keeping in mind that farmstead wiring involves not only a residence, but also a business establishment.

Reporting on the Investigation of Abuse and Bridging of Edison-Base Plug Fuses, J. D. Lynett had samples of many dangerous makeshifts and spoke on the Inspector's desire to stop the prevalent use of coins and the like in Edison-base cutouts. There followed a motion unanimously adopted to request the early reinstatement in the Code of a mandatory date for the installation of Type "S" fuseholders.

New developments in Air-Cooled Dry-type Transformers were illustrated by W. W. Satterlee of Westinghouse, showing the latest in design employing only inorganic materials and doing away with the hazards associated with liquid-cooled transformers.

The delegates were the guests of General Electric on Monday evening at Television Studio WRGB, when a special show was staged and television explained

Here's information you can use, NOW!

New FIBERGLAS* ELECTRICAL INSULATION MATERIAL BOOKLET . . . TELLS WHAT TYPE TO USE, WHERE AND HOW . . .

This free, new booklet will be helpful to anyone concerned with the specification or application of electrical insulation.

It will help you determine which of the many types of Fiberglas electrical insulation materials should be used for a specific job.

The booklet will show you where this better insulation material can be used advantageously for electronic, radio and electrical applications.

It will indicate the ways to use Fiberglas electrical insulation material to obtain all of the benefits which it affords.

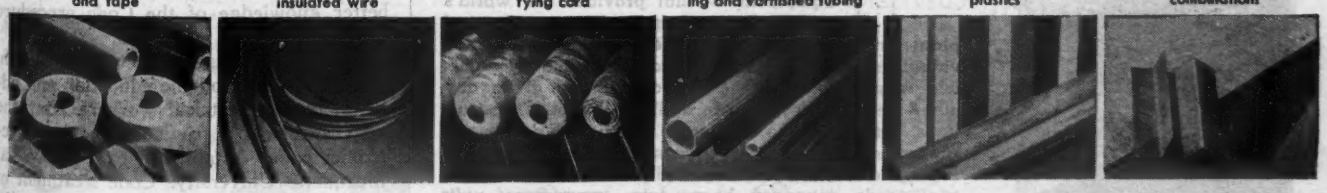
Containing complete information about Fiberglas, the new booklet illustrates Fiberglas fibers and filaments twisted into yarns, served on wires, woven into tapes and cloths, braided into sleevings and formed into tying cords.

It describes the unique combination of electrically and mechanically important characteristics of Fiberglas such as: high temperature, moisture and acid resistance, favorable space factor and high tensile strength. It shows how the insulating impregnants increase the effectiveness of Fiberglas' inherent characteristics and add others such as high dielectric strength, insulation resistance and resistance to abrasion.

You will see why the use of this basic, inorganic, insulating material is increasing so rapidly—why so many designers, manufacturers and repair shop operators prefer it.

Be sure to have a copy of this new booklet in your file for ready reference. Write for your copy today —there is no obligation. Address: *Owens-Corning Fiberglas Corporation, 1856 Nicholas Building, Toledo 1, Ohio. In Canada, Fiberglas Canada Ltd., Oshawa, Ontario.*

Fiberglas varnished cloth and tape | Fiberglas insulated wire | Fiberglas tying cord | Fiberglas saturated sleeving and varnished tubing | Fiberglas laminated plastics | Fiberglas-mica combinations



ARMY E NAVY

FIBERGLAS

*T. M. Reg. U. S. Pat. Off.

ELECTRICAL INSULATION MATERIAL

BADGER

Synchronous Automatic **TIME SWITCHES** *for*

ACCURATE TIMING

•

ECONOMICAL OPERATION

•

YEARS OF GOOD SERVICE

•

• *Prompt delivery on orders rated AA-5 or Higher.*

Type	Poles	Switch Capacity	Case
M1 (Synchronous)	1	50 A. at 125 V.	16 Ga. Steel
M2 "	2	50 A. at 125/250 V.	16 Ga. Steel
RM "	1	50 A. at 125 V.	Cast Iron
RM5 "	2	50 A. at 125/250 V.	Cast Iron

RELIANCE AUTOMATIC LIGHTING CO. RACINE WISCONSIN

WORLD'S FASTEST PAGING

BELL VOICE PAGING

Here's a "bellboy"—BELL Voice Paging Equipment — that provides the world's most efficient paging for any type of plant—any size. In a very few seconds, any individual anywhere in the plant can be called by name, told *why* and *where* he is wanted, and given any other message desired. In addition, bulletins, instructions, time and alarm signals, and recorded music programs can also be broadcast over Bell Voice Paging Systems. They are specially designed for industrial needs—standard, heavy-duty, tamperproof units combine readily to meet requirements of any extent or capacity, and permit easy expansion or rearrangement. Write today for details!

BELL SOUND SYSTEMS

BELL SOUND SYSTEMS, Inc.
1196 Essex Ave., Columbus 3, Ohio
Export Office: 4900 Euclid Ave., Cleveland 3, Ohio

and viewed. The amazing progress and possibilities of the new form of entertainment certainly presented tremendous commercial possibilities.

Paul Goodell of Trumbull Electric Mfg. Co. and member N. F. P. A. Infra-Red Committee, spoke on industry developments, R. B. Shepard of Underwriters' Laboratories gave the results of an Investigation of Substitute Materials and Methods, and D. L. Beeman of General Electric illustrated the use in industry of High-Voltage Distribution to Load-Center substation units.

C. S. Casterline of Syracuse, N. Y., was elected president, F. N. M. Squires and A. W. Hopkins were re-elected secretary and treasurer respectively, P. J. Hicks of Providence, R. I., first vice-president and E. T. Quinn of Newark, N. J., second vice-president.

SOUTHERN INSPECTORS CONFER IN ATLANTA

***Reported by* W. T. Stuart**

Winding up the annual series of regional meetings of the International Association of Electrical Inspectors, the Southern Section conference was held in Atlanta, Georgia, September 25-27 with approximately 150 attending.

In view of the imminent revision to the National Electrical Code, a large proportion of the meeting time was devoted to discussion of wartime interim rules and their effects on electrical safety. James D. Lynett, president of IAEI, urged that inspection take a vigorous stand wherever the safety of the public is in question. He urged the inspectors and the industry to keep in mind that the coming revision is a postwar code that will probably not reach final publication until early 1946. For that reason we must think beyond wartime scarcities and restrictions.

M. A. Brandon, Underwriter Laboratories, New York, presented the results of a nationwide survey on the experience of electrical inspections with wartime substitutes and rules. The consensus was that most of the emergency measures should be eliminated as quickly as possible.

J. J. Siddall, H. H. Robertson Company, Pittsburgh, urged closer coordination of section activities, pointing out the responsibility of IAEI as the one industry forum that has industry-wide support.

George Welman reporting for the postwar committee discussed the need for a better knowledge of the Code procedure among electrical inspectors.

Marion H. Hedges, director of research, I.B.E.W., spoke on the education and adjustments of electrical workers after the war, reviewing in particular the new electronics course established by I.B.E.W. at Marquette University. Code treatment of infra red drying equipment was discussed by H. N. Pye of Atlanta and code treatment of welding apparatus and installations by B. Z. Segall, New Orleans.

E. C. Knox of Mimai was named President for 1945 and G. M. Ross of Sheffield, Alabama, first Vice President. A. M. Miller of Richmond, Virginia, was re-elected Secretary-Treasurer.

How are you at Chopping Trees?

No, this is no joke. Many businessmen have volunteered to aid the paper shortage by spending vacations from their companies in the timber country, helping out on the man-power problem in the paper pulp industry.

Not that you have the time to do this. Nor that tree-chopping is exactly in your line. But, until the man-power shortage in this vital industry is over, until our armed forces no longer are spread all over the world where food, ammunition and medical supplies must be shipped them in paper protection wrappers, there is a chopping job you must do. You must chop the use of paper in your business.

Sure, you've done plenty of this in the past months. But right now the need for paper is greater than ever. So the government asks you again to examine paper usage in your firm, see if you can't make even further savings.

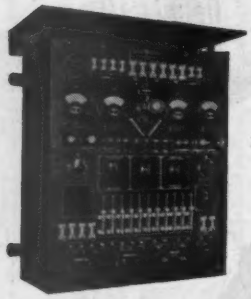
And don't forget that baling wastepaper and sending it to a reprocessing plant is a most important part of the paper conservation job.

Remember—
PAPER IS WAR POWER

USE LESS PAPER—SAVE ALL WASTEPAPER

This advertisement contributed by this publication and prepared by the War Advertising Council in cooperation with the War Production Board and the Office of War Information.

Electrical Specialties
of Every Type
Including MARINE WORK



WORK TEST PANEL—built to customers' specifications and Navy standards.

RADIO MOTOR-GENERATOR and SELECTOR CONTROL PANEL—built to customers' specifications for any number of circuits.

JMM CO

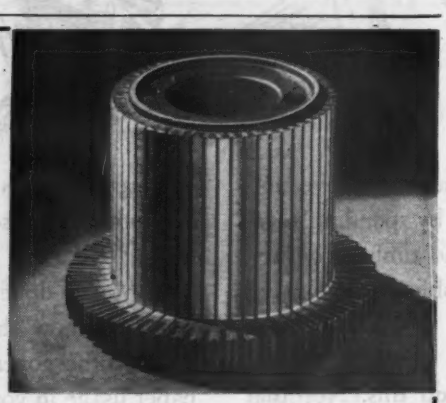
ALL types of electrical specialties, boxes, cabinets, control panels, ductwork, etc., manufactured by an organization accustomed to meeting exacting Army, Navy and Commercial specifications. Full engineering personnel and equipment for manufacture of special electrical items to customers' needs in addition to all standard articles. Let us quote you on your requirements. Write for illustrated catalog.

ARMY E NAVY

JACKSONVILLE METAL MANUFACTURING CO.

247 RIVERSIDE AVE., JACKSONVILLE, FLORIDA

A MESSAGE to *Electric Motor* REPAIR MEN



For the past three years it has been extremely difficult for us to fill orders from our many motor repair shop friends. This was due to high priority ratings and the fact that twenty-four hours a day were not enough to fill all of the orders for commutators going into planes, tanks, ships and other fighting equipment . . . Today because of our vastly increased capacity, we are able to meet your requirements within a reasonable length of time. Three sources to choose from—all under *capable* and *experienced* management . . . Our representatives are located in key cities throughout the nation.

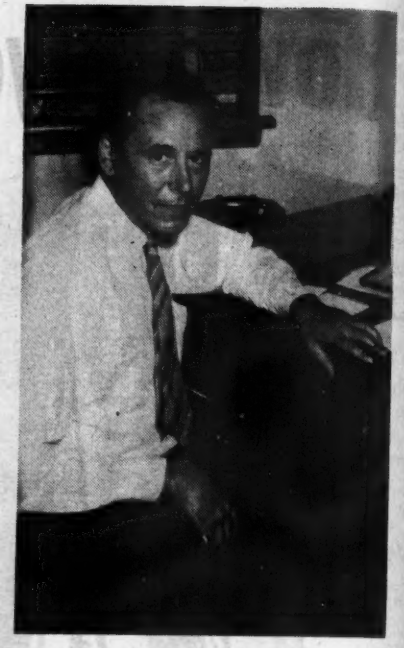
Over Ten Million Since Pearl Harbor

TOLEDO STANDARD COMMUTATOR CO. – Toledo 6, Ohio

HOMER COMMUTATOR CORP. – Cleveland 3, Ohio

HILLSDALE COMMUTATOR CO. – Hillsdale, Michigan

THE NATION'S LARGEST EXCLUSIVE MANUFACTURERS OF QUALITY COMMUTATORS



INDUCTION HEATING is one of the specialized phases of electrical installations followed by John T. Jones, secretary-treasurer of the Hall Engineering Company, one of Detroit's leading electrical construction firms.

RESTRICTIONS ON CONDUIT, TUBING AND RACEWAYS REMOVED FROM L-225

Restrictions on the installation of electrical conduit, electrical metallic tubing and raceways have been removed from Order L-225, which was amended as announced by the War Production Board.

Formerly, installations were permitted only for specified end uses. Restrictions were imposed as a temporary measure to save critical materials. Their removal is now possible because the supply of the type of steel used in the manufacture of conduit, tubing and raceways has eased, WPB said.

The amount of metal (by weight) that may be used in the manufacture of this equipment is still limited by L-255 on the basis of the amount used in 1941. The order also retains provisions restricting sales by manufacturers and distributors to those with preference ratings of AA-5 or better. Manufacturers are still required to make monthly reports to WPB on sales and shipments.

DIRECTIVES 8 AND 9 REVOKED

Emergency specifications controlling the design of structural steel and reinforced concrete for building construction during the present war have been revoked, the War Production Board has announced. The revocation became effective October 4.

Directive 8, controlling National Emergency Specifications for the design of structural steel for buildings, and Directive 9, controlling National Emergency Speci-

fications for the design of reinforced concrete, were issued to control the scarce supply of steel and large building programs in the early days of the war. These conditions no longer prevail, WPB said, and revocation of these directives should clear up uncertainties in the minds of architects and engineers as to the extent of governmental controls in construction materials during the postwar period, WPB explained.

Directive 29, embodying the National Emergency Specifications covering the design and fabrication of stress grade lumber and its fastenings for buildings, will remain effective because of the present scarcity of lumber, WPB said.

CMPR 9-A CLARIFIED BY WPB

The War Production Board clarified the provision covering the amount of copper wire and cable that electricians, electrical contractors and repairmen of domestic appliances; radios, and refrigerators are permitted to purchase under provisions of Controlled Materials Regulation 9-A.

Considerable misunderstanding has existed among repairmen and wholesalers about these provisions and has resulted in the sale of a great more copper wire and cable for repair purposes than was intended, WPB officials said.

Under no condition, officials emphasized, should any repairman buy or any wholesaler sell any copper wire or cable for electrical conduction under the provision of CMP Regulation 9-A, which permits repairmen covered by the regulation to purchase each quarter a total of 500 pounds of copper and copper base alloy brass mill and foundry products. It is not intended that wire mill copper products, including wire and cable (bare, insulated, armored, and copper-clad steel) for electrical conduction be purchased under the 500 pound classification.

Only the following products may be purchased under that provision:

Brass Mill Products: Alloy sheet and strip—alloy plate, sheet, and strip (including strip equivalent of ammunition cups and discs); alloy rods, bars and wire including extruded shapes—alloy rods, bars and wire (including extruded shapes and ammunition slugs); alloy seamless tubing and pipe; brass mill copper products—plate, sheets, and strip; rods, bars, and wire, including extruded shapes (not including wire bars and ingot bars, or rod and wire for electrical conduction); tube and pipe.

Foundry copper and copper-base alloy products—Castings (before machining).

CMP Regulation 9-A does, however, permit certain repairmen to purchase $150 worth of copper wire and cable each quarter or one-eighth of what the purchaser used in making repairs in 1941 (figured as accurately as possible in dollar value), whichever is more. Only refrigeration, radio, and domestic appliance repairmen and electricians and electrical contractors are eligible, however, officials explained.

FOR *Dependable Wiring*

SWITCHES and CONVENIENCE OUTLETS

G-E standard switches and convenience outlets will benefit any wiring job. They are easy to install . . . good looking . . . will help sell jobs. They will give long service that will please your customers.

Both G-E standard switches and G-E standard convenience outlets are high quality products. They can be used equally well in factories, office buildings, homes, stores, etc. They are ideal for new wiring or wiring replacements or extensions.

These devices are always uniform, have plaster ears and large binding screws. The switches are completely insulated with Textolite and are "T" rated. The convenience outlets are made of brown Textolite or ivory compound.

For further information see the nearest G-E Merchandise Distributor or write to Section D1141-8, Appliance and Merchandise Department, General Electric Co., Bridgeport, Conn.

GE2841 Standard Single-pole Switch. Also GE2516, double pole; GE2514 three-way, GE2515 four-way. All with brown-colored handles. Similar switches with ivory-colored handles.

GE2679 G-E Standard Convenience Outlet, common feed and ground, brown color. Similar outlet in ivory color.

BUY WAR BONDS AND KEEP THEM

Hear the General Electric radio programs: "The G-E All Girl Orchestra" Sunday 10 P.M. EWT, NBC. "The World Today" news every weekday 6:45 P.M. EWT, CBS.

GENERAL ELECTRIC

PARTS FOR CONTROLS MOTORS FANS

PROMPT SHIPMENT FROM LARGE STOCKS

AUTHORIZED PARTS DISTRIBUTORS

Brown-Brockmeyer	General Electric	Master
Century	Hamilton-Beach	Peerless
Cutler-Hammer	Holtzer-Cabot	Robbins & Myers
Delco	Howell	Star
Diehl	Hunter	Thor
Duro	Ilg	Wagner
Emerson	Leland	Westinghouse
	Marathon	

READING ELECTRIC COMPANY, INC.

Parts Distributors for the Manufacturer

200 William St. *Barclay 7-6616* **New York 8, N. Y.**

A Complete Line of

BAKELITE

OUTLET BOXES *and* COVERS

THAT MEET THE NATIONAL ELECTRICAL CODE AND APPROVED BY FEDERAL HOUSING ADMINISTRATION

BOXES FURNISHED WITH OR WITHOUT CLAMPS

No. 3060 No. 4060 No. 5060 No. 6060 No. 7060

Nos. 3061 & 4061 Nos. 3062 & 4062 Nos. 3063 & 4063 Nos. 3064 & 4064 No. 4065 Nos. 3057 & 4057 Nos. 3058 & 4058

SAFE • ECONOMICAL • DURABLE • NEAT

The sizes and design, except for clamps and wire knockouts, same as standard metal outlet boxes. They take standard type of fixture studs. Two clamps supplied with each box. The wire clamps hold against 125 lbs. pull. When used with fixture studs they withstand over 400 lbs. pull on stud.

These Bakelite Outlet Boxes have side knockouts and clamps to take 14-2, 14-3, and 12-2 non-metallic sheathed cable, and 14-2, 14-3, 12-2 and 12-3 CNX Type Cable and one ½ in. Bottom Knockout.

These covers are sufficiently thick to obviate breakage in installation or use. Standard color Black.

UNION INSULATING COMPANY, INC.

FACTORY: PARKERSBURG, W. VA.

SALES OFFICE: 27 PARK PLACE, N. Y. C.

This wire or cable may be purchased and sold only for the uses specified in CMP Regulation 9-A, mainly maintenance and repair work. Additional wire is permitted, however, under conditions outlined in the regulation for connecting-up purposes and for reconditioning work.

Electrical contractors and repairmen doing maintenance and repair work for businesses listed in Schedules I and II of CMP Regulation 5 and 5-A should find it advantageous to use their customer's MRO symbol to buy the copper wire and cable needed, rather than to buy it under the V-3 allotment symbol of CMP Regulation 9-A. Purchases under the latter regulation may then be used for civilian maintenance and repair work.

NECA ENDORSES NPA INCOME TAX PROGRAM

The National Electrical Contractors Association, by resolution at its 43rd Annual Meeting at French Lick Springs Hotel, October 1-6, endorsed the following four specific recommendations of the National Planning Association with respect to taxation of corporate income for the transition period:

1. *War Tax Settlement Proposal:* After partial victory has been won, with the cessation of hostilities in either hemisphere, the due dates for federal income and excess profits taxes on earnings of the then current year and the unpaid portions of the similar taxes on profits of the preceding year should, at the option of the corporation, be deferred, subject to a 6 percent per annum interest penalty, to the due dates of the following year's taxes pending redetermination of liability under the loss and unused excess profits credit carry-back provisions of the tax law. If at the end of such following year, the corporation finds that it actually owes the taxes in whole or part, such liability should be consolidated with the liability of the third year and paid at the same time. In the event the taxes are ultimately found to be owing, the interest penalty should be charged for the period of deferment.

2. *Excess Profits Tax Elimination:* After total victory has been won, with the cessation of hostilities in both hemispheres, the present excess profits tax should be eliminated. The elimination should be pro-rated, so that if the cessation occurs, say at the beginning of the tenth month of a taxable year, the excess profits tax will not be applicable to one-fourth of the corporation's profits for that taxable year.

3. *Capital Stock Tax Elimination:* On the cessation of hostilities in both hemispheres, both capital stock tax and the declared value excess profits tax should be eliminated.

4. *Normal and Surtax Reduction:* On the cessation of hostilities in both hemispheres, the normal corporate tax should be reduced from 24 percent to 16 percent and the surtax should be reduced from 16 percent to 8 percent leaving an aggregate tax on corporate income of 24 percent. At some later date the 24 percent

rate then applicable to corporate income should be further reduced, but the timing of further reduction should be determined in the light of the then existing economic situation. The first step in further reduction might be the elimination of the 8 percent surtax.

CHICAGO EMSA HOLDS SECOND ANNUAL CONCLAVE

Based on the success of last years' general conference, the Electric Motor Service Association of Chicago, Central District Chapter, NISA, held its second annual conclave on October 10 with more than 65 shop men from Illinois, Wisconsin, Indiana and surrounding area guests of the association.

A broad program, centered around the theme of reduction in shop production costs to meet postwar conditions in the motor service industry, got under way in early afternoon when more than forty of the guests visited seven local repair shops to glean and swap "shop kinks" and other time saving ideas. Shops visited were those of the Excel Electric Service Co.; Ther Electric and Machine Co.; Arthur Wagner Co.; Chicago Electric Co.; Hyre Electric Co.; Gregory Electric Co.; and Northwestern Electric Company. Subjects of interest on this tour included cleaning booths, repair and machine shop layouts, sandblasting, plastic molding, burnout ovens, dynamic balancers, zanderizing process (dipping, varnishing and drying), transformer winding machines and other interesting shop ideas.

Following the tours, the guests convened at the Electric Club dining room for dinner and the evening business session. Among the visiting NISA notables were R. B. Turner, Windsor, Ontario, Canada, vice-president, NISA; Charles C. French,

A. A. TOGESEN, president of the Electric Association of Detroit, welcomes electric league managers at the opening of the recent I.A.E.L. conference in Detroit.

How this safer panel protects you against FIRES and EXPLOSIONS

You're assured complete, dependable protection against fires and explosions — plus the greater freedom from current interruptions possible only with circuit breaker control — when you specify Kinney Type II-G Dust Tight Panelboards for all dust-hazardous locations in your plant.

First to be listed as dust tight by Underwriters', this unique Kinney panel is completely enclosed in a dust tight box, sealed against dust entrance by a heavy Seigelite gasket between box and front. Circuit breakers are operated by dust tight, externally controlled toggle mechanisms which protrude through the front. There are no doors to open—no surfaces for dust to collect on—no danger of igniting explosive dusts or inflammable flyings in the atmosphere.

Kinney Type II-G Dust Tight Panelboards are available with Nofuze and Quicklag breakers and are arranged for 2, 3 and 4 wire mains of 125 volts A.C. or D.C., single phase; 125/250 volts A.C. or D.C. single phase and 120/240 volts A.C. three phase respectively. Panels are available in sizes from 4 to 20 branch circuits.

LISTED BY UNDERWRITERS' LABORATORIES FOR CLASS II, GROUPS F and G and CLASSES III and IV HAZARDOUS LOCATIONS

Consult your local inspection authority having jurisdiction to determine the extent and location of dust hazardous conditions in your plant—and for unfailing protection specify and install Kinney Type II-G Dust Tight Panelboards in all such locations.

PANELBOARDS **KINNEY** SWITCHBOARDS

KINNEY ELECTRICAL MFG. COMPANY • 2900 CARROLL AVENUE • CHICAGO 12, ILLINOIS

ELECTRICITY
For Any Job—Anywhere

Reliable, economical electric service for electrical contracting projects anywhere, anytime, with an Onan Electric Generating Plant. From the 65 basic models, the right plant for any job or application, large or small, can be selected.

Driven by Onan built, 4-cycle gasoline engines, these power plants are of single-unit, compact design and sturdy construction. Suitable for all mobile, stationary or emergency service.

Model shown is from W2C series, 2 and 3-KW, 60-cycle, 115 volt; powered by water-cooled, 2-cylinder engine.

ELECTRIC PLANTS Onan

POWER AND LIGHT FOR EVERY NEED

Models range from 350 to 35,000 watts. A.C. types from 115 to 660 volts; 50, 60, 180 cycles, single or three-phase; 400, 500, and 800 cycle, single phase; also special frequencies. D.C. types range from 6 to 4000 volts. Dual voltage types available. Write for engineering assistance or detailed literature.

Over 200,000 In Service

D. W. ONAN & SONS

2096 ROYALSTON AVE., MINNEAPOLIS 5, MINN.

QUADRANGLE COMPLIANCE WITH RIM

QUAD
LIGHTING UNITS

A few things for contractors to remember about QUAD Units . . . they all have correct basic design and construction features and will give customers highest lighting efficiency. A full line of Industrial Lighting Equipment that stays popular. QUAD . . . for today and for tomorrow.

ADJUSTABLE PORCELAIN ENAMELED FLOODLIGHT

● Manufacturers of Incandescent and Fluorescent Lighting Equipment

QUADRANGLE MFG. COMPANY

32 S. PEORIA ST. CHICAGO, ILLINOIS

St. Louis, Mo., immediate past-president, NISA; C. L. Harry, president, Wisconsin Chapter, NISA, Milwaukee; R. A. Sherer, Indianapolis, NISA Awards Committee.

Addressing the dinner meeting, Charles French, dispelled some of the fears of shop operators about their postwar future. Pointing out that it's service that keeps the independent business man going, he listed prompt repair service, spare and rental motors, and the willingness of shop operators to gamble their "know how" to help a customer out of a jam, as the salient advantages the independent motor dealer has to offer his clientele. Discussing the presentation of papers on shop operation to the national convention, Mr. French urged a policy of having such papers printed and distributed to various shop men before the meeting so prepared written discussions could accompany the presentation of the paper at the sessions. Such a policy would release constructive criticism and suggestions that would benefit all present, he contended.

Touching upon the subject of resale of electrical equipment by motor repair shops, R. B. Turner, outlined the normal conventional growth of the average motor repair shop which gradually gets into the "renewed" motor business and finally into the sale of new motors. Contending that such resale activity will keep the shop salesmen busy during slack periods in the repair department, he urged NISA to compile data on the appropriate resale lines, for the benefit of those shops who may want to enter this phase of the business.

Speaking in general terms, Arthur Wagner, Chicago, reiterated the fact that too many shop operators are too busy making a living to consider improvements in their own shops. He urged each man to return to his own shop with a critical eye toward making such needed improvements as will increase their production efficiency. J. Ferrari, Chicago, concurred that such a thorough inspection would more than pay for itself through the time and material savings affected by the improvements.

Taking up where they left off in the afternoon, the group again entered an "idea swap" period with more than a dozen different "shop kinks" being offered by the various members. The conclave concluded with the usual EMSA "for sale and wanted" session at which members were offered an opportunity to locate hard-to-get, much needed equipment.

GENERAL REGULATION NO. 3

To help war contractors and Government contracting agencies settle terminated war contracts faster, regulations for pre-termination settlement agreements were recently announced by Robert H. Hinckley, Director of Contract Settlement. Through pre-termination, contracting agencies can make settlement agreements with war contractors in ad-

THREE VIEWPOINTS on postwar store lighting were presented at recent Technical Session, I.E.S. store lighting symposium in Chicago, by (L to R) Kenneth C. Welch, vice-president, Grand Rapids Store Equipment Co.; Nathaniel A. Owings, Skidmore, Owings & Merrill, architects and engineers, Chicago; and R. J. Chapin, Supt. construction and maintenance, Marshall Field & Co., Chicago.

vance of the actual termination of contracts.

Details were covered under Regulation 3 issued by the Office of Contract Settlement with the approval of the advisory board composed of representatives of the War Department, Navy Department, Treasury Department, United States Maritime Commission, Foreign Economic Administration, Reconstruction Finance Corporation, War Production Board, Smaller War Plants Corporation, and the Attorney General.

"The purpose of General Regulation No. 3 is to clarify the right of the contracting agencies to make settlement agreements in advance of actual termination," Mr. Hinckley said. "These agreements may cover one or more of the elements that will be involved in termination claim. They are to be used when they will substantially facilitate settlements, plant clearance, reconversion to civilian production or the efficient use of materials, manpower and facilities, or will otherwise promote the objectives of the Contract Settlement Act of 1944.

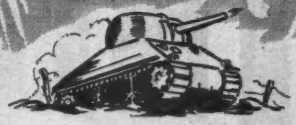
"Experiments have now established that it is frequently possible to negotiate such agreements with contractors ahead of time. Where this can be done, it will result in great savings in the time required for the contractor to reconvert to peacetime work. It will thus greatly minimize the dislocation and unemployment that might otherwise result from contract termination.

"The Procurement Policy Board of War Production Board has had the subject under consideration for some time, and has now recommended to the Director of Contract Settlement, as has the Contract Settlement Advisory Board, that pretermination settlement agreements be used as widely as possible. The War Department has had some experience in negotiating agreements of this type, particularly in the textile field, and in some phases of ordnance production. These experiments indicate the great desirability of agreeing beforehand, where sufficient data is

PITTSBURGH REFLECTOR COMPANY'S

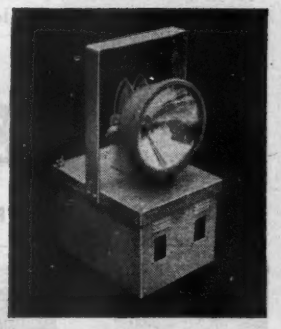
Lighting FOR FIGHTING

ON LAND



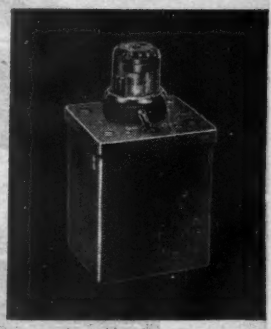
for U. S. ARMY ENGINEER CORPS – At dead of night . . . on blacked-out roads and trails . . . in England, France, Italy, Burma, and the islands of the Pacific . . . wherever American power is on the move . . . Pittsburgh-produced FLASHER BEACONS direct tanks, trucks, troops in the onward march to victory.

ON SEA



for U. S. NAVY – Pittsburgh-produced Electric Emergency Lanterns . . hand-portable, equipped with flood-light and storage battery . . . simple, strong, dependable . . . are performing yeoman service in emergency damage control work on board all types of our fighting ships.

IN THE AIR



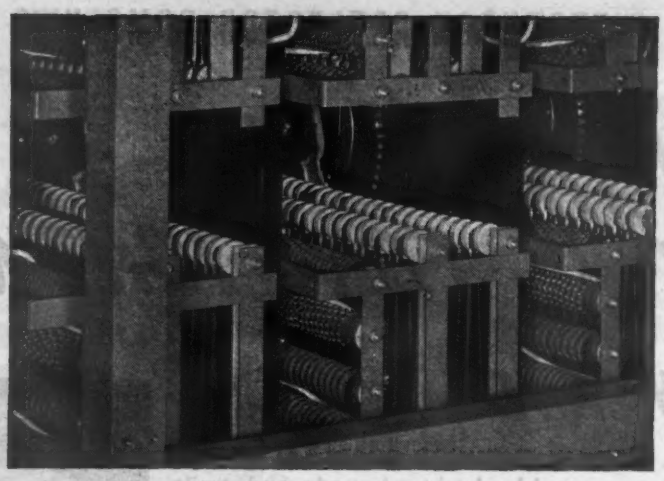
for U. S. ARMY AIR CORPS.– Cockpit Lamp Assembly – The Air Corps drew up the specifications for it. In record time Pittsburgh lighting engineers produced a successful model. Now, mounted on all combat aircraft, from control panel to gun turrets, equipped with extension cord and providing suitable intensities of light for varying conditions, including blackout flying, these cockpit lamps provide "quick seeing" for any task.

PITTSBURGH REFLECTOR COMPANY takes deep satisfaction in being called upon to produce these and many other important war items . . . as well as in supplying Permaflector illuminating equipment adapted to the needs of our armed forces at home and abroad. Into the production of these war items went the same engineering experience and craftsmanship which has made "Pittsburgh" synonymous with QUALITY and PERFORMANCE in the commercial and industrial lighting field.

PITTSBURGH REFLECTOR CO.
OLIVER BLDG., PITTSBURGH, PA.

ILLUMINATING ENGINEERS DESIGNERS & MANUFACTURERS of COMMERCIAL & INDUSTRIAL LIGHTING EQUIPMENT

• Now producing confidential lighting equipment for the Armed Forces and supplying Industrial users on priority (Commercial replacements from stock). Startling new post-war developements now in work will soon be announced.



ADAPTABLE and DEPENDABLE RESISTORS

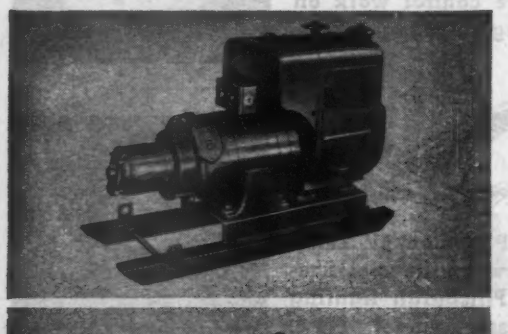
Adaptability and dependability of resistors assume primary importance in the assembly of large rheostat control units. The wide range of resistance values and capacities that can be built up from the Ward Leonard line is limitless. The many types and mounting arrangements permit the meeting of load requirements in minimum space. Whatever your requirements you will find a Ward Leonard Resistor that exactly meets your conditions. Send for Bulletins.

WARD LEONARD

RELAYS • RESISTORS • RHEOSTATS

Electric control (WL) devices since 1892.

WARD LEONARD ELECTRIC COMPANY, 28 SOUTH ST., MOUNT VERNON, N. Y.



MASTER GAS-ELECTRIC GENERATING PLANTS

COMPACT PORTABLE

SAVE TIME AND SPEED WORK WHEREVER POWER OR LIGHTING IS REQUIRED

Eleven basic sizes from 500 watts to 17,000 watts and 30 different types to meet all AC or DC power or lighting requirements. Housed or open models . . . available with wheelbarrow, buggy or trailer mounting. For operating a single tool or motor, or floodlight . . . or gangs of tools, groups of motors, or lighting entire areas. Easy to put in operation . . . economical to operate and maintain. Compact, portable, self-contained.

For complete details write for Bulletin 594.

MASTER VIBRATOR COMPANY

Dayton 1, Ohio • Distributors throughout United States and Canada

Products Include: Concrete Vibrators, Gas or Electric Surfacing Attachments, High Speed Tools • Vibratory Concrete Finishing Screeds • Rotary Concrete Floor Finishing Machines • Portable Gas Electric Generator Plants, 500 Watt to 17000 Watt, Voltage Regulators and Portable Mountings Optional • Master Flood and Shovel Lights • Electric or Gas Engine Driven Power Blow Hammers

available to permit reasonable forecasts on a sound commercial basis, on items such as the unit cost of the inventory which the contractor will have on hand at various stages of manufacture, whether this inventory is to be scrapped, taken over by the Government, or retained by the contractor, and the prices which should apply if the contractor plans to keep it.

"To the extent that the contractor agrees to retain inventory or work in process, these agreements will materially reduce the amount of surplus which comes into the Government's hands for ultimate disposition. They will also permit the contractor to plan his peacetime production on an assured basis and avoid temporarily shutting down his production lines, as he might have to do if a similar agreement with the Government had to be negotiated after he received his termination notice.

"Where the amounts involved are small and detailed calculations would not be worthwhile, it will frequently be possible to agree with the contractor on a lump sum payment in complete settlement of his claim under the terminated contract. This may even be possible in a limited class of cases involving larger amounts where unusually reliable data are available."

MINNESOTA ELECTRICAL COUNCIL APPROVES SERVICE PROGRAM

A broad program of membership service activities was carefully reviewed and approved at a recent mid-year meeting of the Board of Directors of the Minnesota Electrical Council, Inc., Minneapolis. Among the service features of the proposed program are:

1. A membership campaign.
2. The preparation of a special bulletin on a program of preparation for the reconversion and postwar periods.
3. A store and shop planning service including designs of modern store display fixtures to provide member stores with an attractive highspeed "sales appeal."
4. A special advertising program designed to fit the advertising budget of all members along the following lines: (1) Institutional copy telling purchasers of the background, knowledge, experience, service, and equipment of competent electrical dealers; (2) product advertising designed to develop business on appliances, lighting—commercial and residential; wiring, electric farm equipment, etc.; and (3) mailing pieces to promote business and services of members of the Council.

Considerable doubt was raised as to the prospect of obtaining a statewide electrical inspection law. Under study at present is the Youngstown, Ohio Plan which incorporates an independent rating or inspection bureau, organized and managed by all branches of the electric industry, conducted as a non-profit enterprise and recognized by the utilities and Public Service Commission of Ohio.

A Sales Control Ordinance, which would regulate and prohibit the sale of electrical equipment, lamps, toys and other

appliances which were unapproved and hazardous to life and property was also discussed in detail. The council Board suggested that members desiring to promote such ordinances in their local communities secure copies of the N.E.M.A. model sales control ordinance from the Council headquarters.

The final action of the Board meeting was a statement on Cold Cathode fluorescent lighting. Recognizing the possibility of installations being made without compliance with state and local regulations the Council Board adopted the following statement: "It is the opinion of the Board of Directors of the Minnesota Electrical Council that Cold Cathode Fluorescent or Neon type lighting equipment should be installed by skilled licensed electricians with special attention to safety requirements for operating voltage in excess of 230 volts".

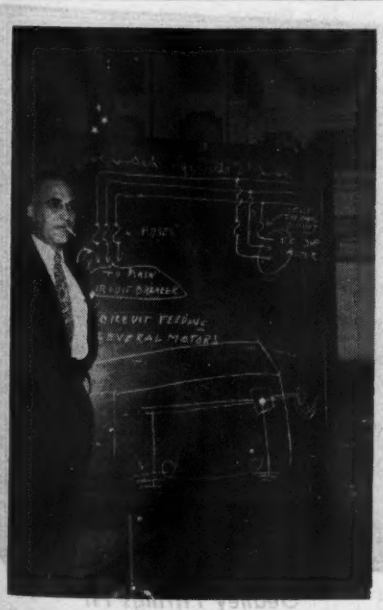
INCREASED ELECTRIC WATER HEATER PRODUCTION AUTHORIZED

Additional material has been authorized to increase fourth-quarter production of electric water heaters for civilian use from 12,500, as originally approved, to 30,000, the War Production Office of Civilian Requirements has announced.

This increase is necessary because of the acute need for such equipment, WPB officials explained.

Production of electric water heaters for civilian use was resumed during the third quarter of 1944, beginning July 1, at the rate of 12,500 for the quarter. Prior to that time production for civilians had been prohibited except when it was found necessary to allow some production on an appeals basis.

Order L-185, controlling production of water heaters, will be amended soon to provide for the increase in production per-



BLACKBOARD SESSION on Code problems at recent Western Section, I.A.E.I. conference in Indianapolis is handled by L. P. Dendel, Lansing, Michigan

AIR EXPRESS

the shortest distance between two points!

FAR SHORTER BY THE CLOCK—one mile is 20 seconds in the air!

SPECIFY AIR EXPRESS. Get your shipment the fastest way!

NOTE TO SHIPPERS: Ship order when ready, early-day shipping means quicker delivery.

A Money-Saving, High-Speed Tool For Every Business

With additional planes and space available for all urgent cargo, 3-mile-a-minute Air Express directly serves hundreds of U.S. cities and scores of foreign countries. And shippers nationwide are now saving an average of more than 10% on Air Express charges—as a result of increased efficiency developed to meet wartime demands.

WRITE TODAY for "North, East, South, West"—an informative booklet that will stimulate the thinking of every executive. Dept. PR-11, Railway Express Agency, 230 Park Avenue, New York 17, N. Y., or ask for it at any local office.

AIR EXPRESS

AIR EXPRESS

Gets there FIRST

Phone RAILWAY EXPRESS AGENCY, AIR EXPRESS DIVISION

Representing the AIRLINES of the United States

GREGORY TRANSFORMERS

Power Distribution and Special Types

The immediate dependable answer to transformer problems . . . .

750 KVA Gregory Oil-Immersed self cooled Distribution Outdoor Transformer

- **UNIQUE DESIGN — afford low copper and core losses — extra factor of safety protects against temporary overloads or power surges.**
- **CONSTRUCTION—tanks constructed of heavy gauge copper bearing steel welded throughout.**
- **OIL — Hi-Grade insulating oil used exclusively.**
- **BUSHINGS — Highest grade of wet process porcelain — featuring solderless connectors exclusively.**
- **ACCESSORIES — Highest Quality obtainable meeting our exacting requirements.**
- **INSULATION — Coordinated with bushings to protect against surges.**

GREGORY for the past fifty years has been serving our country and our United Allies. Municipal, Federal, and R.E.A. projects all over the world have come to realize that transformers designed and manufactured by GREGORY means dependable, long life service and satisfactory operation. GREGORY Transformers conform to A.I.E.E., E.E.I., and N.E.M.A. standards. All transformers are backed by an iron-clad guarantee.

Our engineering staff and technical experience is at your disposal. Tell us your transformer requirements or problems

GREGORY EST. 1893 Hi-Grade **GREGORY ELECTRIC CO.**

2537 So. STATE ST. CHICAGO 16, ILL.

mitted by the additional allocation of material.

Production of electric water heaters for the armed services and for the National Housing Agency is not included in the 30,000, WPB explained.

CONSERVATION ORDER L-41 AMENDED

Construction of certain utility buildings, formerly restricted by Conservation Order L-41 and by Utilities Orders U-1, U-3 and U-4, is now restricted only by the utilities orders, the War Production Board has reported.

The change was made by amendment to Order L-41, which eliminates such construction from restrictions of that order.

By utility construction is meant any building or group of buildings to be used directly in furnishing electric, gas, water, central steam heating or wire communications services (telephone or telegraph).

Formerly, all utility construction was controlled by Order L-41, with a $1,000 allowable exemption for the construction of any single unit building or group of buildings without obtaining WPB approval.

Under the amended order, only sewage systems utility construction is retained in Order L-41, with a $1,000 exemption allowed for any building or group of buildings that will be used directly for a sewage system and owned by a sewage system operator as defined in Order P-141.

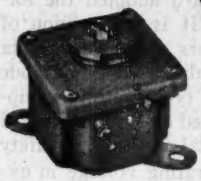
COPPER WIRE AND CABLE MAY BE EASED

Unless projected requirements for copper wire and cable are materially altered, the reduced military demands, after "Victory in Europe" Day, will permit copper wire and cable mill facilities to accept and deliver orders other than authorized controlled material orders in a pattern

LEAGUE ACTIVITIES of the neighboring states of West Virginia and Ohio are being reviewed by (L to R) H. M. Silling, sec'y-treas. of the Electric League of Charleston and E. J Beil, manager, the Electric League of Youngstown at recent I.A.E.L. conference in Detroit.

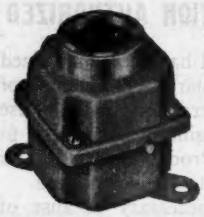
THE AUSTIN LINE MARINE ELECTRICAL EQUIPMENT

Combination Switch and Receptacle Boxes—W. T. and N. W. T.—double pole, single throw-switch, and single-phase receptacle.



Single, Double, and Triple Receptacle Boxes—W. T. and N. W. T.—single phase.

Branch Boxes—W. T. and N. W. T.—have no fuses and are used to connect branch circuits. Branch Junction Boxes are fuseable.



AUSTIN Marine Products, some of which are shown here, are made to the highest engineering standards carefully inspected and packed, and fully approved by the U. S. Navy. Send for Marine Catalog No. 9-8-2 for complete details on the AUSTIN line.

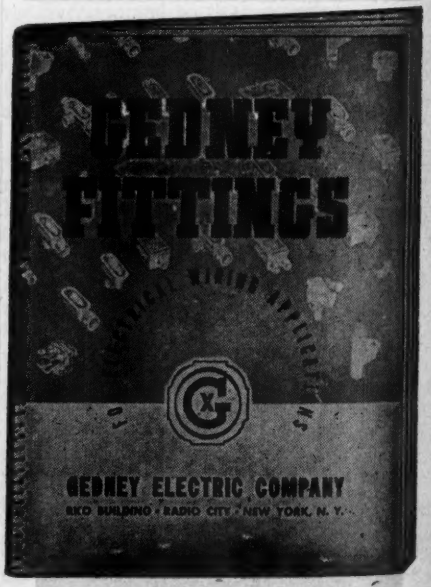
Lamp Type Indicator Boxes — Watertight. Furnished complete with clear green, red, blue, yellow and opal lens.

THE M. B. AUSTIN COMPANY

108-116 S. DESPLAINES ST., CHICAGO

SEND FOR THIS HELPFUL DATA ON

GEDNEY FITTINGS



"Gedney Fittings Fit"

SOLD THROUGH WHOLESALERS

GEDNEY ELECTRIC COMPANY

RKO BUILDING NEW YORK 20, N. Y.

BE WELL INFORMED on modern developments, urged Edward J. Brown, president, I.B.E.W., as he addressed the recent Indianapolis meeting of the Western Section, I.A.E.I. and outlined the new I.B.E.W. sponsored Marquette University electronics course for journeymen electricians.

and of a copper content approaching pre-war levels, the Copper Wire and Cable Industry Advisory Committee was informed at a recent meeting, the War Production Board has reported.

WPB plans elimination of all unnecessary governmental controls, reports and directions on cessation of European hostilities, officials said. Retention is intended only for those controls needed to insure fulfillment of military requirements for victory over Japan, it was emphasized.

Industrial members recommended that allocation of refined copper and directed production and distribution of intermediate shapes should be continued until victory is achieved over both Germany and Japan. The basis for this recommendation was the possibility that the supply of copper after "V-E" Day will be less than the amount needed to take care of military and civilian requirements. Allocation of the material would then assure all wire companies—independent and producer-controlled—of a fair share of the copper available for civilian use, industry members pointed out.

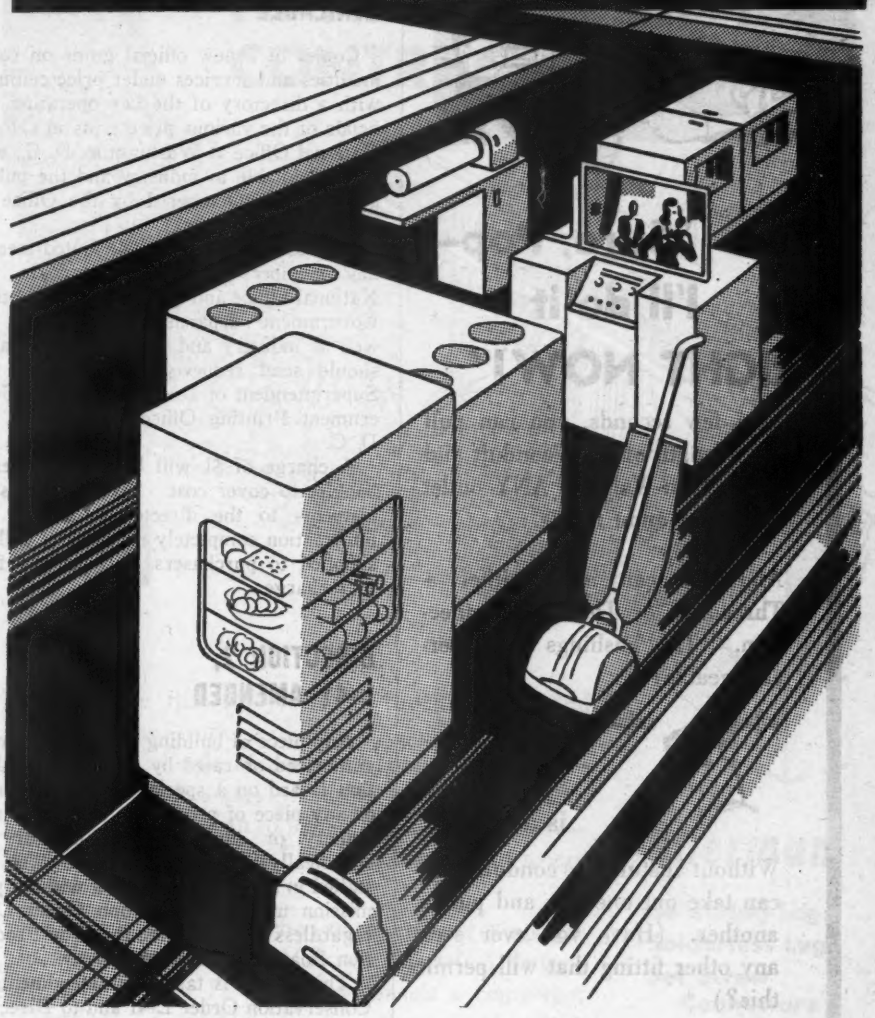
The pre-war pattern of orders for wire and cable consumed considerably more copper than present patterns of orders, a Government official said. However, manpower and manufacturing costs now considerably exceed the pre-war pattern.

Tin, crude rubber and certain chemicals used as components of copper wires and cables are still in tight supply and it is likely that strict control of these materials will continue after the defeat of Germany, a Copper Division representative said.

Removal of all restrictions on deliveries to and from warehouses of copper wire mill products, after "V-E" Day, is also contemplated, the industry was informed by WPB.

Production of copper wire and cable, with the exception of certain communica-

WIRE TODAY FOR TOMORROW'S LOAD



● Tomorrow's big parade of new electrical appliances will mean greatly stepped-up loads for wiring! If it's PORCELAIN PROTECTED — knob and tube wiring—it will carry a BIGGER load in accordance with conductor capacities established by the N.E.C. Experience of half-a-century proves this method does a far better job from the standpoint of simple installation, low cost, safety, long life and dependability. Meets all requirements of directives calling for non-metallic wiring and non-metallic wiring materials. Talk to your Electrical Inspector about wiring trends and safety—he knows fire prevention facts from A to Z. Write for wiring manual.

PORCELAIN PRODUCTS, Inc.
FINDLAY, OHIO
Wire Today for Tomorrow's Load

"Sure, Pop— I'll do it RIGHT NOW!"

In a few seconds, you can pull out a length of rigid conduit and insert Thin-Wall—at ANY outlet of ANY Kondu fitting.

And you can make either a Threadless or Threaded connection. (The bushings are interchangeable).

Every Kondu box is a Union

Without disturbing conduit, you can take out one box and put in another. (Have you ever seen any other fitting that will permit this?)

Self-locking . . . Kondu gives you a rigid, permanent, vibration-proof connection. Practically unbreakable . . . 100% re-usable. Quickest to install. *Write for the Kondu catalog.*

KONDU CORPORATION

Erie, Pa.

Kondu Mfg. Co., Ltd., Preston, Ontario

tion wires, is at a level high enough to insure the completion of all military programs, and the progress made by the industry was most gratifying, Government representatives said.

OPA GUIDE AVAILABLE

Copies of a new official guide on commodities and services under price ceilings, with a directory of the key operating officials of the various price units in OPA's National Office at Washington, D. C., was made available to industry and the public generally on October 1 by the Office of Price Administration.

This booklet is being distributed free to key members of OPA's staff in the National Office and in the field. All other Government departments interested as well as industry and the public generally, should send requests for copies to the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

A charge of $1 will be made for each booklet to cover cost. Six monthly supplements to the directory, bringing its information completely up to date, will be supplied to purchasers, without any further charge.

DIRECTION 2, L-41 AMENDED

Any piece of building service equipment authorized or rated by the War Production Board on a special application form, or any piece of processing or service machinery or equipment whether or not specifically approved, may now be installed in an existing building without permission under Conservation Order L-41, regardless of cost limits, the War Production Board has reported.

This action is taken by amendments to Conservation Order L-41 and to Direction 2 of the same order.

Direction 2, as amended, provides that it is not necessary to get WPB permission under L-41 to install or relocate in an existing building any piece of processing or service machinery or equipment regardless of the total cost of the job.

OVER 30 YEARS in the motor business is the record of Mrs. A. A. Fagan, owner of Fagan Electric Company, Little Rock, Arkansas. She and O. W. Wallar (right) repair shop superintendent are carrying on in larger headquarters while her son Ellis serves in the U. S. Army Air Corps.

Processing machinery or equipment is machinery or equipment used for the manufacture, processing or fabricating of materials or products. Service machinery or equipment is defined as equipment used in a building by means of which a particular service is rendered in the building; for example, X-ray equipment in a hospital, projector or screen equipment in a theatre, cold storage enclosures of coolers in a store or commercial establishment.

The direction also permits the installation of building service equipment, such as plumbing, heating, lighting, air-conditioning equipment, elevators or escalators, regardless of the total cost of the job, if the equipment has been authorized or rated on a WPB special application form.

In addition, building alterations required in connection with the installation may be made, but no new buildings or additions to existing buildings may be constructed, WPB stressed. Materials required for the installation or necessary alterations may be obtained under Direction 15 to Controlled Materials Plan Regulation No. 5, which was recently amended to give, to persons not specified

CROSS COUNTRY electrical league officers at the I.A.E.L. Detroit conference included (L to R) Ralph Neumuller, executive vice-president, Electrical & Gas Association of New York, Inc.; Denny Shaler, manager, Electric League of Western Pennsylvania, Pittsburgh; and H. P. Wilson, secc'y-mgr., Electrical Institute of the Tri-Cities, Rock Island, Illinois.

on Schedule A of that regulation, preference ratings and allotment symbols for the limited acquisition of such materials.

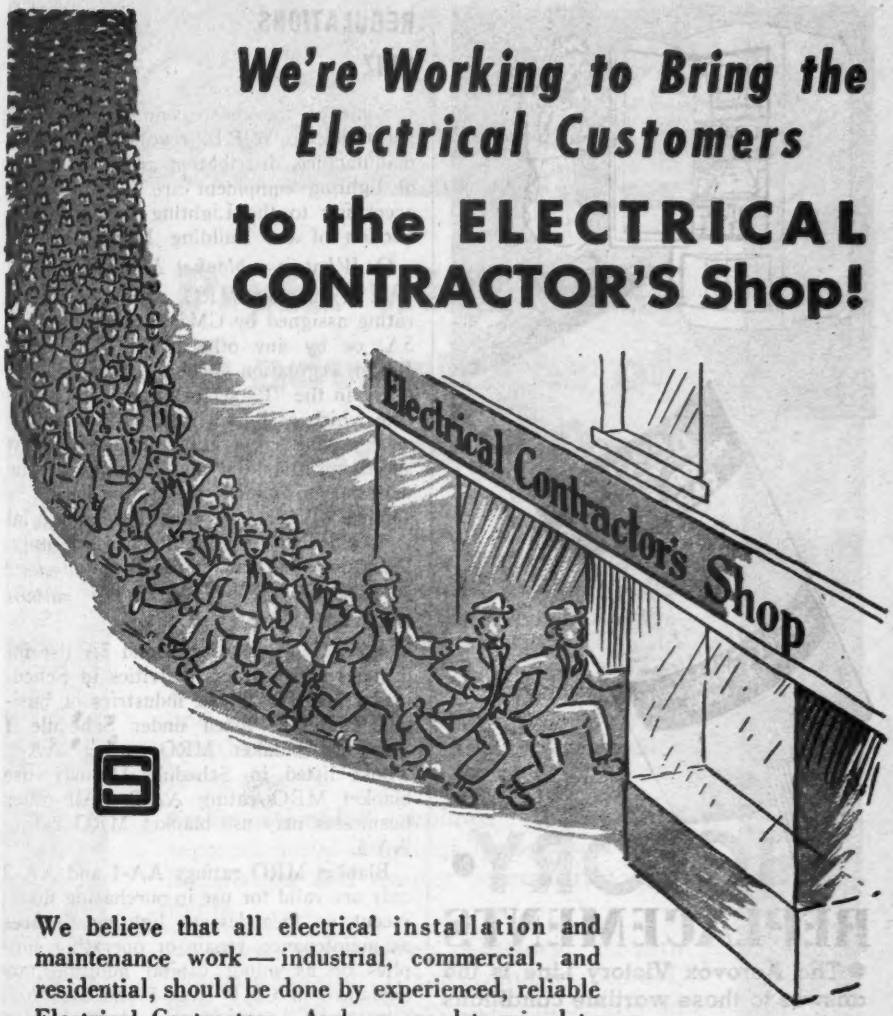
Formerly under Direction 2 to Order L-41, machinery or equipment installations without WPB approval were limited to $25,000, and relocations were not permitted if the cost of materials necessary to install a single piece or a group of pieces of machinery or equipment exceeded $500. These restrictions are now eliminated, as is the former restriction against the installation of any machinery or piece of equipment to be used for the manufacture of items the production of which is prohibited by any WPB order.

The exception from Order L-41 given by these amendments do not eliminate the restrictions of other WPB orders, which may require special authorization to buy or install other kinds of equipment, WPB officials emphasized.

LEE R. McCULLOUGH, executive director, Metal Fabricators' Institute, Chicago, and former regional director, Priorities Div., WPB and OCR, tells the Cook County Electrical Contractors Association that manpower is the dominant bottleneck in the reconversion program.

MASSACHUSETTS ELECTRICAL CONTRACTORS MEET

At a meeting of the Massachusetts Electrical Contractors Association on October 5, it was decided to ask manufacturers of electrical merchandise to include in all their advertising and publicity a message or phrase urging all installations to be made by licensed or certified master electricians. The Safety Committee headed by Fred Fontana is also working out a plan of cooperation with the insurance companies.



We're Working to Bring the Electrical Customers to the ELECTRICAL CONTRACTOR'S Shop!

We believe that all electrical installation and maintenance work — industrial, commercial, and residential, should be done by experienced, reliable Electrical Contractors. And we are determined to do everything we can to bring the electrical business back to the shop of the Electrical Contractor, *where it belongs.*

We have therefore launched an advertising campaign in which we are going to tell electrical buyers everywhere why IT PAYS to consult a competent Electrical Contractor whenever there is electrical power, lighting, or control equipment to be installed or repaired.

We are going to tell the public that the Electrical Contractor is the *only* man who has the training, experience, and equipment to do good electrical work . . . that the Electrical Contractor *protects the public safety* through his expert knowledge and observance of local codes and regulations. And we are going to urge all branches of the Electrical Industry to support and protect the Electrical Contractor.

This advertising is prepared to help YOU — Mr. Contractor. Watch for it!

Sherman

- Soldering Lugs
- Solderless Lugs
- Set Screw Connectors
- Bolted Connectors
- Fixture Connectors
- Ground Clamps
- Rigid Ground Fittings
- Electrical Terminals
- Battery Connectors
- Splicing Sleeves
- Wedge Grip Connectors

H. B. SHERMAN MFG. CO.
BATTLE CREEK, MICHIGAN

Sherman ELECTRICAL SPECIALTIES

VICTORY• REPLACEMENTS

• The Aerovox Victory Line is the answer to those wartime conditions and restrictions. A drastic reduction in number of types has been achieved without impairing satisfactory servicing. You can keep those electric refrigerators going for the duration, with these Victory replacements . . .

VICTORY LINE

Victory Line of 22 capacitance values in electrolytic type, for 110-volt operation; 6 values for 220-volt operation. These 28 universal types have been critically selected so that a minimum stock provides for maximum service needs. Indeed, these 28 types can take care of upwards of 90% of all motor-starting capacitor replacements.

Handy Aerovox Conversion Chart indicates the Victory equivalent for any previously available type.

• Ask your jobber for Aerovox Victory Capacitors. Ask to see the Conversion Chart. Order your capacitors from him. Or write us direct.

AEROVOX Capacitors
INDIVIDUALLY TESTED

AEROVOX CORP. NEW BEDFORD, MASS., U. S. A.
In Canada: AEROVOX CANADA LTD., HAMILTON, ONT.
Export: 13 E. 40 St., New York 16, N.Y. Cable: ARLAB

REGULATIONS QUIZ

Some of the most common questions pertaining to W.P.B. regulations on the manufacture, distribution and installation of lighting equipment are the following according to the Lighting and Fixtures Section of the Building Materials Div.

Q. *What is a blanket MRO rating?*

A. A blanket MRO rating means a rating assigned by CMP Regulation 5 or 5A, or by any other War Production Board regulation, order, (including an order in the "P" series), form or certificate which assigns a rating for maintenance, repair or operating supplies without specifying the kind and quantity of the material to which the rating may be applied. Where the quantity of material is specified in terms of dollar value only, the rating is a blanket MRO rating.

Q. *What has blanket MRO ratings AA-1 and AA-2?*

A. CMP Regulation 5 and 5A list industries and business activities in Schedules I and II. Those industries or business activities listed under Schedule I may use blanket MRO rating AA-1. Those listed in Schedule II may use blanket MRO rating AA-2. All other businesses may use blanket MRO rating AA-5.

Blanket MRO ratings AA-1 and AA-2 only are valid for use in purchasing fluorescent or incandescent lighting fixtures as maintenance, repair or operating supplies or as minor capital additions, as explained in CMP Reg. 5 and 5A.

Q. *What ratings other than blanket MRO ratings are valid for sale or delivery of incandescent or fluorescent lighting fixtures?*

A. Flourescent or incandescent lighting fixtures may be sold or delivered on any preference rating which has been assigned pursuant to application made on Forms WPB-541, WPB-542, WPB-547 or WPB-617.

Q. *Can an electrical repairman use the preference rating and allotment symbol assigned to him by CMP Reg. 9A to purchase (1) an incandescent lighting fixture, or (2) a fluorescent lighting fixture?*

A. (1) The preference rating of AA-3 and allotment symbol V-3 may not be used by a repairman to purchase a complete incandescent lighting fixture, but may be used to purchase a component part of an incandescent lighting fixture which part is to be used in repairing a damaged fixture.

(2) The preference rating of AA-3 and allotment symbol V-3 may not be used by a repairman to purchase a complete fluorescent lighting fixture or part. However, parts needed for repair of an existing fluorescent lighting fixture may be purchased without a rating.

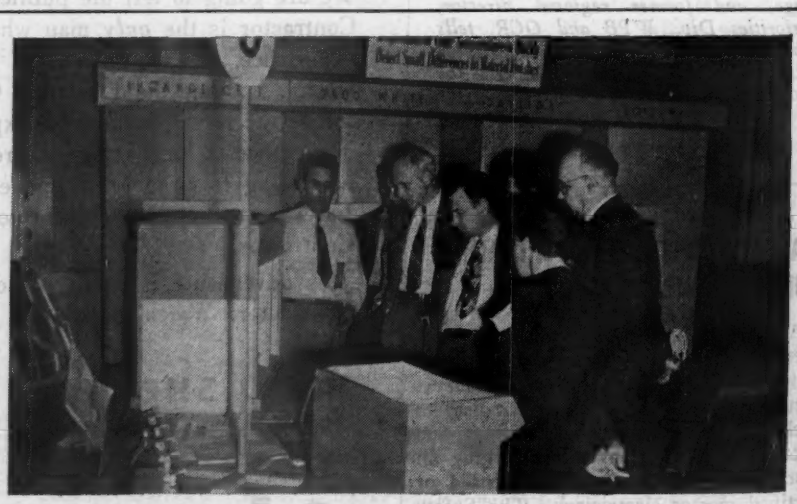
Q. *Can an electrical wholesaler or dealer assemble lighting fixtures?*

A. Yes. However, it is necessary for him to apply on Form CMP-4B as a manufacturer for an allotment of controlled materials as a separate business enterprise. He may then apply the CMP allotment symbol and preference rating assigned to him to his orders for components, and fill such orders from his stock. He may not use materials or components obtained through the use of ratings assigned to him on WPB-547 applications without CMP authorization. Materials obtained for stock with WPB-547 preference rating must be sold in the form in which they are purchased. The same is true for an allotment of copper wire purchased for resale.

Q. *Can a fluorescent "kitchen unit" which attaches to a four inch or six inch fitter (incandescent fixture) and which is equipped with a cord and plug be (1) manufactured, (2) sold?*

A. The term "kitchen unit" is not used in Order L-78. It is understood that a "kitchen unit" means a fluorescent lighting fixture employing one, two, three or four 20 watt tubes in which the fixture is sometimes designed to be attached to a four inch or six inch incandescent enclosing glass globe holder, and may also be equipped with a cord and plug for the purpose of making electrical connection to an incandescent fixture.

(1) Order L-78 prohibits the manufac-



WAR PLANT INSPECTORS gather round engineer E. M. Prims to learn about the importance of light in color identification and matching at the Chicago Lighting Institute's recent clinic on inspection lighting.

ture and assembly of any fluorescent lighting fixture designed for one or more hot cathode tubes, rated 30 watts each or less, except industrial portable or industrial attachable type fixtures as defined in Order L-78. Therefore, kitchen units may not be manufactured.

(2) Yes, on rated orders only, or on authorization by the War Production Board to sell on unrated orders when the units have been held in inventory since June 2, 1942.

DATES AHEAD

Utah Chapter IAEI—Monthly meeting, Auditorium of Utah Power and Light Co., Salt Lake City, Utah, November 7.
George Washington Chapter IAEI—Monthly meeting, District Building, Washington, D. C., November 13.
Association of Electrical Construction Engineers—Regular meeting, 2 Park Ave., New York, N. Y., November 13.
Rocky Mountain Chapter IAEI—Monthly meeting, Denver, Colo., November 14.
Roger Williams Chapter IAEI—Monthly meeting, Providence, R. I., Nov. 15.
Electrical and Gas Association of New York, Inc.—Lecture Course on "Electronic Applications in Industry," 480 Lexington Ave., New York, N. Y., November 16.
Electrical Institute of the Tri-Cities—Auditorium, Iowa-Illinois Gas & Electric Co., Rock Island, Ill., November 16.
Electrical & Gas Association of N. Y.—Thanksgiving Luncheon, Hotel Astor, New York, November 22.
Southern California Chapter IAEI—Pasadena, Calif., November 22.
Manufacturers of Illumination Products, Inc.—Joint Conference Committee, 545 Fifth Ave., New York., November 28.
Electrical and Gas Association of New York, Inc.—Lecture Course on "Electronic Applications in Industry," 480 Lexington Ave., New York, N. Y., November 30.
Electrical Institute of the Tri-Cities—Davenport Chamber of Commerce, Davenport, Iowa, November 30.
Utah Chapter IAEI—Monthly meeting, Salt Lake City, Utah, December 5.
American Institute of Consulting Engineers—Luncheon and Council Meeting, City Midday Club, New York, N. Y., December 6.
Electrical and Gas Association of New York, Inc.—Lecture course on "Electronic Applications in Industry," 480 Lexington Avenue, New York, N. Y., December 7.
Association of Electrical Construction Engineers—Regular meeting, 2 Park Avenue, New York, N. Y., December 11.
George Washington Chapter IAEI—Monthly meeting, District Building, Washington, D. C., December 11.
Rocky Mountain Chapter IAEI—Monthly meeting, Denver, Colo., December 12.
Independent Electrical Contractors Association, Inc.—Headquarters of Electrical & Gas Association, 480 Lexington Ave., New York, N. Y., December 13.
Electrical Institute of the Tri-Cities—Auditorium, Iowa-Illinois Gas & Electric Co., Rock Island, Ill., December 14.
Electrical and Gas Association of New York, Inc.—Christmas luncheon, Grand Ballroom, Hotel Astor, New York, N. Y., December 20.
Roger Williams Chapter IAEI—Monthly meeting Providence, R. I., December 20.
Kentucky Chapter IAEI—Louisville, Ky., January 11 and 12, 1945.
American Institute of Electrical Engineers—Technical Meeting, Engineering Societies Building, New York, N. Y., January 22-26, 1945.
Indiana Chapter IAEI—Antlers Hotel, Indianapolis, Ind., February 1-2, 1945.
National Electrical Manufacturers Assn.—Spring Conference, Palmer House, Chicago, Ill., April 16-19, 1945.
Electrical Committee, N.F.P.A.—Edgewater Beach Hotel, Chicago, Ill., Week of May 14, 1945.
American Institute of Electrical Engineers—Summer Technical Meeting, Hotel Statler, Detroit, Mich., June 25-29, 1945.
International Lighting Exposition—Palmer House, Chicago, Ill., April 19-23, 1945.
National Electrical Wholesalers Assn.—Spring meeting, April 23-25, 1945.

Profit with these 6 advantages of J-M Transite Ducts

Light-weight . . . made of asbestos and cement, Johns-Manville Transite Ducts are light and easily handled. Thinner walled Transite Korduct, for use in concrete envelopes, is especially light in weight.

Long lengths . . . these ducts are so strong and light that they can be made in longer lengths to save you time, with fewer joints, fewer spacers.

Easily assembled couplings . . . The use of tapered sleeve couplings further speeds up installation and assures permanently tight joints.

No concrete envelope necessary . . . with Transite Conduit. It's so strong, so rotproof, fireproof, and rustproof that—underground or above ground, it needs no protective concrete casing, paint, or other preservative treatment.

Long, trouble-free life . . . Made of two mineral products, Transite Ducts get stronger with the years. Cannot deteriorate.

No priorities needed . . . Being non-metallic, Transite Ducts are readily available in quantity for whatever use you may have for them.

JM JOHNS-MANVILLE
TRANSITE DUCTS

TRANSITE *CONDUIT* Designed for exposed work and for use underground without a concrete encasement. Saves plenty of installation time.

TRANSITE *KORDUCT* For use in concrete. Thinner walled, otherwise identical with Transite Conduit

EVERY PHASE of electrical maintenance and repair work covered in this library

5 volumes of practical how-to-do-it information

Every man concerned with the care and repair of electrical machinery should have these practical books, with their helpful tables, diagrams, data, methods and kinks. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong. Liberal use has been made of practical data and practice in repair shops so as to combine the good features of a library of methods with handbook information covering these methods.

Electrical Maintenance and Repair Library

2042 pages, 1721 illustrations and diagrams

These books show you how to

—install all types of motor and generator units;
—locate breaks in armature windings and do a workmanlike job of rewinding;
—know just what is wrong with an electrical machine and take charge of installation and maintenance work;
—make accurate tests of switchboards and apparatus and correctly balance the power with the load;
—handle every sort of wiring job;
—show competence whether it be in the use of a Stillson wrench or a Wheatstone bridge.

Includes trouble-shooting book

Now, in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a book giving helpful maintenance information, special trouble-shooting charts, explanation of symptoms and causes of machinery trouble, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

10 days' examination
Easy monthly payments

We want you to examine this Library for 10 days. If you don't want them at the end of that time, there's no obligation to keep them. On the other hand if you decide you want the help these books can give, start the small monthly payments then, and in a short time the books are yours, right while you have been using them. Send the coupon today.

EXAMINATION COUPON

McGraw-Hill Book Co., Inc.
330 W. 42nd St., New York 18, N. Y.

Send me Electrical Maintenance and Repair Library, 5 volumes, for 10 days' examination. If I find the books satisfactory, I will send you $1.00 in 10 days, and $2.00 a month until $15.00 has been paid. Otherwise I will return the books postpaid.

Signature .....
Address .....
City and State .....
Firm or Employer .....
Position ..... EC. 11-44

MANUFACTURERS NEWS

GRAYBAR APPOINTMENTS

Graybar Electric Company announces the appointment of J. D. Daly as supply sales manager at executive headquarters in New York City. Since 1935 he has been commercial manager for Graybar at the Hartford, Conn. branch office and warehouse. His duties as supply sales manager for Graybar will include the planning of sales for all types of wiring supplies used for inside electrical construction.

L. B. Westfall has been named Ohio Valley district manager with headquarters in Cincinnati. In addition to heading up the Cincinnati office and warehouse operations, he will have jurisdiction over Graybar offices and warehouses in Nashville, Tenn., Columbus and Dayton, Ohio, and Louisville, Ky.

C. E. Furber has taken over the duties of manager of the Graybar office and warehouse in Columbus.

On November 15, R. W. Kimberlin will become Mississippi Valley district manager of Graybar with headquarters in St. Louis and will have jurisdiction over the Graybar office and warehouse in Memphis, Tenn. as well as those in St. Louis.

G. T. Marchmont has taken over the duties of Southwestern District Manager for Graybar with headquarters in Dallas. Mr. Marchmont replaces M. A. Buehler who is retiring on a service pension.

Effective November 15, W. E. Henges will take over the duties of Erie District Manager in Cleveland, replacing A. L. Perry who is retiring on a service pension.

A. D. Hammond has been appointed southern district manager for Graybar with headquarters in Atlanta. The territory under Mr. Hammond's jurisdiction will include the Graybar offices and warehouses at Birmingham, Ala., Columbia, S. C., Knoxville and Chattanooga, Tenn.

J. P. Wear, Jr. has taken over the duties of Graybar district merchandising manager with headquarters in Philadelphia.

V. K. Stalford has been appointed merchandising manager in Detroit, replacing J. P. Wear, Jr., who has been moved to Philadelphia.

G-E CHANGES

Major changes in the General Electric Company's home appliance and construction material sales organization have been announced by H. L. Andrews, vice president of the company.

C. R. Pritchard has been appointed to the newly-created position of general sales manager of the G-E appliance and merchandise department, and will be responsible for all sales and sales policies of appliances and construction materials, responsible to the vice president. Other appointments placed A. M. Sweeney in the position of manager of sales of all

C. R. PRITCHARD

major appliances, and C. W. Theleen in the post of manager of sales of all traffic appliances and vacuum cleaners. Both will be responsible to Mr. Pritchard, as will J. H. Crawford, who continues as manager of sales of G-E construction materials. A. C. Sanger, appliance sales manager for the past year, has resigned.

A. L. Scaife has been appointed merchandising manager for the entire appliance and merchandise department, and will also be responsible to Mr. Pritchard. L. H. Miller immediately becomes manager of the household refrigerator division, and C. J. Enderle manager of the company's electric sink and cabinet division.

The traffic appliance divisions are separated into heating device and fan divisions and the clock division. The engineering, manufacture and sales of sunlamps, heat lamp, heating pads and electric heaters of the plug-in type were transferred from the heating device and fan divisions to the pioneer products division.

M. B. Ross, formerly sales manager of the traffic appliance divisions, was made manager of the heating device and fan divisions. R. O. Fickes, formerly in traffic appliance sales, was appointed to the post of manager of the clock division. Other announcements included the appointments of George E. Mullin, Jr., as sales manager for the electric sink and cabinet division, R. E. Boian, sales manager of heating devices, and C. R. Thorson, sales manager of clocks.

WESTINGHOUSE SUPPLY CHANGES

William B. Meek has been appointed manager of the new branch office of the Westinghouse Electric & Supply Company, New Orleans, La. This territory was formerly served by the Monroe Hardware Company, a Westinghouse agent-jobber, located at Monroe, La. and New Orleans. The new office has been established at 420 South Peters Street.

The appointment of A. C. Kacher as manager of the Minneapolis, Minn. branch of the Westinghouse Electric Sup-

ply Company has been announced. Mr. Kacher joined the organization in October, 1921 and since 1929 he has been an apparatus and supplies salesman in Minneapolis, Minn.

Russell N. Chapman has been named apparatus and supply manager of the New England District, with offices in Boston, Mass. Mr. Chapman was transferred to his present position from that of manager of the Westinghouse Electric Supply Company, Marine Department, in Boston.

ROEBLING ELECTIONS

Charles Roebling Tyson has been elected president of the John A. Roebling's Sons Company of Trenton and Roebling, N. J. Mr. Tyson succeeds the late William A. Anderson, who died on September 10, 1944.

Lt. Joseph M. Roebling, now serving abroad with the United States Army Air

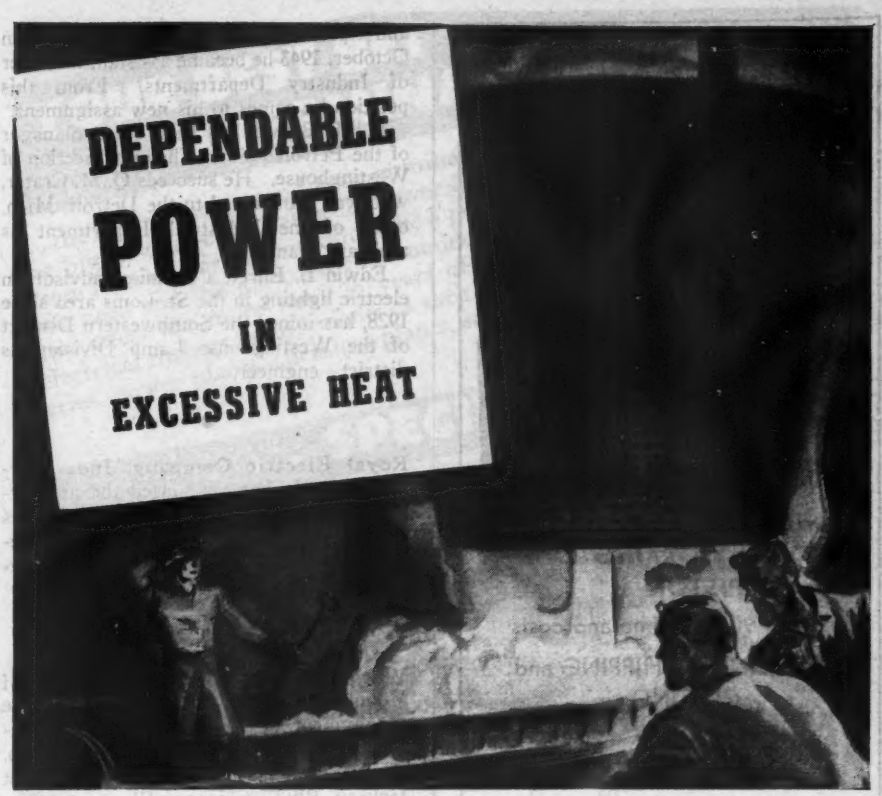
C. R. TYSON

Corps, was elected chairman of the board of directors of the company. Other officers elected were Archibald W. Brown, as treasurer, and H. D. Rathbun, as secretary and assistant treasurer.

WESTINGHOUSE APPOINTMENT

J. H. Jewell has been appointed manager of the Industry Departments of the Westinghouse Electric & Manufacturing Company. Mr. Jewell has been a member of the Westinghouse organization since 1920. He has held various posts and in 1940 was made manager of the Agency

J. H. JEWELL



with DELTABESTON

Deltabeston *Asbestos*-insulated Power Cables are designed for control, lighting and power circuits where severe service conditions prevail. Mill operators rely on Deltabeston for wiring around kilns, soaking pits, furnaces, boiler rooms and in other torrid zones. They know where excessive heat is the predominant factor, Deltabeston *Asbestos*-insulated Power Cables provide the utmost in service. Deltabeston not only successfully resists heat but moisture, oil, grease and most corrosive vapors.

For additional information write to Section Y1144-8, Appliance & Merchandise Dept., General Electric Co., Bridgeport, Conn. Deltabeston Asbestos-insulated Wires and Cables are distributed nationally by Graybar Electric Co., G-E Supply Corp. and other G-E Merchandise Distributors.

1. Copper conductor is centered perfectly providing uniform thickness of the insulating wall.

2. Impregnated felted asbestos is a heat barrier for protection against high conductor temperatures.

3. Varnish Cambric gives moisture resistance and high dielectric strength.

4. Felted asbestos provides plus protection against high ambient heat.

5. Asbestos braid for high resistance to heat, moisture, oil, grease and most corrosive vapors.

Hear the General Electric radio programs: "The G-E All Girl Orchestra" Sunday 10 P.M. EWT, NBC; "The World Today" news every weekday 6:45 P.M. EWT, CBS

BUY WAR BONDS AND KEEP THEM

GENERAL ELECTRIC

THE "ONE-MAN" HAMMER
FOR TEN-MEN'S WORK
SYNTRON
REG. TRADE MARK
DEPENDABLE
ELECTRIC
HAMMERS

with only
"ONE" WORKING PART
—the PISTON
Saves 90% in time and costs
DRILLING—CHIPPING and
CUTTING in
MASONRY and
CONCRETE

Four Powerful Models

"MK"— 5/8"	Cap	$105.00
No. 16—1 1/8"	"	150.00
No. 22—1 1/2"	"	195.00
No. 25—2"	"	225.00

SYNTRON CO. 690 Lexington Homer City, Pa.

Safe-T-Glow

SAFETY RULES call for that EXTRA precaution and additional RECHECK which SAFE-T-GLOW provides. Detects accidental tie-ins, crossovers, leakages and induced voltages . . . prevents serious injury and loss of life. SAFE-T-GLOW consists of sensitive Neon tube, amplified by mirror reflector.

Model A for circuits 2,000 to 35,000 volts.
Model B for circuits from 35,000 to 220,000 volts.

TEST-O-LITE

Tests Everything Electrical from 100 to 550 Volts

Equipped with Neon light which tells instantly where trouble lies in circuits, fuses, cut-outs, motors, etc. Indicates hot or grounded wires. Tells AC from DC. SAVES PRECIOUS TIME. Has PATENTED safety features. Vest pocket size with clip. Lifetime guarantee. List $1.50 (Priority A-7). Purchase thru regular electrical dealers.

L. S. BRACH Mfg. Corp.
55-63 Dickerson St. Newark, N. J.

and Specialties Sales Department and in October, 1943 he became assistant manager of Industry Departments. From this position he comes to his new assignment.

B. M. Brown has been made manager of the Petroleum and Chemical Section of Westinghouse. He succeeds Q. M. Crater, who was transferred to the Detroit, Mich. office of the Industrial Department as assistant manager.

Edwin L. Ehret, a technical advisor on electric lighting in the St. Louis area since 1928, has joined the Southwestern District of the Westinghouse Lamp Division as district engineer.

●

Royal Electric Company, Inc., Pawtucket, R. I., has announced the appointment of M. C. Carroll, as general sales manager. Mr. Carroll was formerly vice-president and sales manager of Chase-Shawmut Company.

●

Ward Leonard Electric Company of Mount Vernon, N. Y. has announced the appointment of Ken Hathaway as manager of their Radio Distributor Division. He will establish headquarters at 53 West Jackson Blvd., Chicago, Ill.

●

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has announced the appointment of W. A. Meyer as manager of dealer sales. He succeeds S. H. Gorham, who has resigned.

●

The Sound Equipment Corporation of California, has announced the appointment of Howard M. Irwin as sales and advertising manager. Mr. Irwin, originally from Chicago, has been in Pacific Coast advertising and retail circles for the past 18 years. The company has recently moved from Hollywood to a new building at 3903 San Fernando Road, Glendale 4, Calif.

●

Copperweld Steel Company, Glassport, Pa. announces the appointment of Rolf Selquist as consulting engineer. He has been with the Copperweld organization since 1928 as electrical engineer.

●

General Controls Company of Glendale, Calif. have announced the opening of a new Kansas City Branch at 421 Southwest Boulevard, Kansas City 8, Mo. with Robert Courtney in charge as branch manager.

●

Allied Radio Corporation, Chicago, have been appointed exclusive midwestern distributors for Creative Plastics Corporation, manufacturers of terminal strips, bushings, specialized products and the new Creative insulating grommet.

NECA Conference Report

[FROM PAGE 31]

versity and the numerous schools held in individual cities. Touching upon the wholesaler problem, he expressed his doubts of education being the sole solution. Continuing, he cited the utility industry for its cooperative attitude in many localities and his belief in honest cooperation as a basis on which our industry must proceed. Concluding he stated that Labor is not interested in annual employment; it is interested in annual earnings as a just compensation for its contribution to the industry.

Presenting an informal report of the NECA-IBEW Postwar Planning Committee, M. H. Hedges, Director of Research, IBEW, revealed that a sound theoretical groundwork of a program has been laid; that the job now is one of implementation and that the Committee should be one of research and analyses, reporting where failures are being made. Urging more integration in the electrical industry, he discussed the question of full employment and revealed that a practical engineering plan has been evolved by which contractors and the Union can work out an annual wage scheme where economically feasible. Two important cities have already adopted the plan, he added, revealing that every leading library in the country has on file the reports of this Postwar Planning Committee.

Citing experts' contentions that a year's construction cannot be increased more than 50 percent above that of the previous year, he predicted a volume of five billions the first year after the war and ten billions the third postwar year—compared to a necessary business volume of 18 billions annually under the postwar economic picture. Unless full employment is planned now, civil strife may ensue when the soldiers return and the question of seniority and job preference take the lead, he concluded.

Revealing that the government will end the war with about 100 billion dollars in outstanding contracts to be terminated and that all conversion hinges on speed and equity of war contracts disputes (after last war average length of settling claims was 3½ years; average payment 12½ cents on the dollar), Paul Fitzpatrick, Administrative Vice-President, American Arbitration Association, outlined the need for arbitration in the settlement of war contracts.

Citing the previous lack of any definite means of arbitrating contracts among the various government and service agencies, he commended the U. S. Senate for its foresight in developing the Contract Settlement Act which became law July 1, 1944, and establishes a uniform settlement procedure for cancelled war contracts for all government war procurement agencies. Discussing the provisions and procedure of the Act in detail, he hailed it as an outstanding contribution to quick conversion, elimination of serious unemployment, and the development of a healthy postwar business position.

E. E. Hedler, manager, Philadelphia Chapter, NECA, outlined to the delegates the Philadelphia Program for Promotion of Industrial and Commercial Business. Commenting on the cooperative spirit of the electric industry in Philadelphia, he outlined the growth of the Electric Association, its active participation in the industry, the lecture and electronics courses set up for contractors and their personnel, the utility policy of having some of their work done by contractors and boosting the contractors in their advertising. He then presented in chart form the series of advertisements the Electrical Constructors of Philadelphia (contractor group) are running in the Chamber of Commerce Magazine and local newspapers—all part of a carefully calculated promotional program directed to a specialized list of prospects.

At the Annual Meeting of the IBEW Employers Section, Paul M. Geary, in his report on labor relations cautioned NECA members against becoming members of general contractors associations, reiterating the basic fact that electrical contracting is a separate entity and should be maintained as such. On the subject of overtime compensation, he urged compliance with NECA and IBEW recommendations that time and one-half be used for the duration regardless of local agreements.

Mr. Geary reported no success in getting the government to sublet electrical work in the shipbuilding industry despite the support of WPB and some Congressmen. Despite the fact that shipbuilding authorities admit contractors can do the work more economically, they argue that the contractor's higher wage rate (marine ceiling $1.20 per hour) presents an unstabilizing influence. Some agencies permit contractors to do this work where local agreements establish a marine rate sep-

[Continued on page 190]

YOUR BEST BET IN TERMINATORS

. . . the right fitting to end your terminating troubles . . . you'll find it in the bigger-than-ever, better-than-ever line of O. Z. Cable Terminators. From its wide variety you can make a perfect match between the fittings you need and the job conditions under which they serve. Back of each you select are more than 25 years of experience meeting the indoor electrical fittings requirements of such diversified industries as oil refineries, power plants, chemical plants, steel mills, sewage disposal plants.

. . . SPECIFY O. Z.

END FITTINGS
A compact fitting for spacing and insulating wires as they come from conduit ends. Body is of malleable iron, cadmium plated; covers of molded canvas Bakelite having high dielectric and mechanical strength.

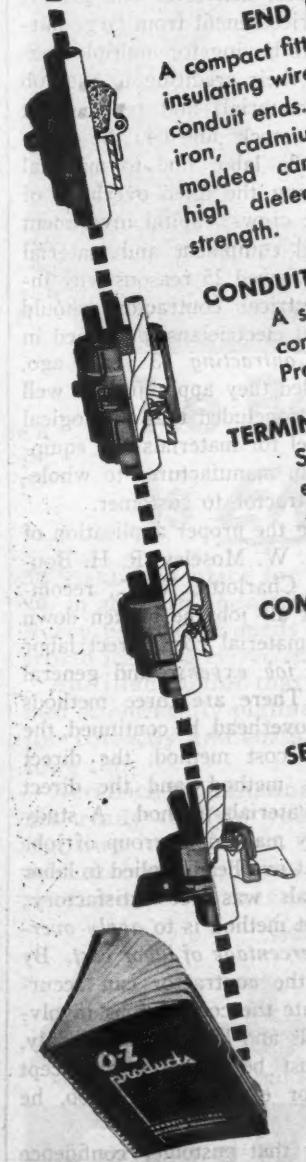
INSULATING BUSHING
Using Bakelite as the insulating medium, this bushing is designed to prevent grounds. Casting is made of malleable iron, cadmium plated.

CONDUIT END BELLS
A simple and effective fitting for sealing the end of conduit where lead cable emerges and is exposed. Practical for use indoors or outdoors.

TERMINATING POTHEAD
Substantial units for sealing conduit and cable ends. This fitting has ample space for sealing compound. Use with either lead or rubber covered cables.

COMPOUND BUSHING
Compact sealing units for use where space is limited. Small reservoir is provided for compound.

SEALING BUSHING
Used in cabinets, control boxes, etc. Has no compound chamber and with its reduced height requires a minimum of space.



The easy O. Z. way to buy

Now the engineer, contractor, or purchasing agent may simplify his work and solve his source of supply problem by placing all orders for *any* standard or *special* electrical fittings direct with us. We can ship from stock or make to your specifications on short notice. Get the O. Z. Catalog—a handy buying guide.

O. Z. ELECTRICAL MFG. CO.
262 BOND STREET · BROOKLYN, 2 N. Y.
REPRESENTATIVES IN PRINCIPAL CITIES

TEST INSULATION THE MODERN WAY

... WITH A MODEL B-5

MEGOHMER

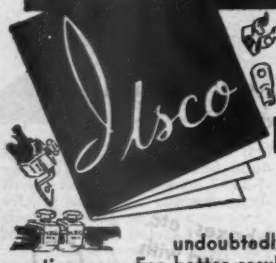
NEW BATTERY-VIBRATOR TYPE

No more tiresome cranking of a hand-driven generator. Entirely self-contained. Steady test potential of 500 volts D.C. available at the touch of a switch. Direct reading in insulation resistance. Various new models and ranges.

Write or phone for Bulletin 430

HERMAN H. Sticht COMPANY, INC.
27 PARK PLACE NEW YORK, N. Y.

ILSCO
Electrical Connectors



Your Post-War Plans

undoubtedly are in formation now. For better results and lower costs Ilsco Products are indispensable. Learn the newest developments in

ELECTRICAL CONNECTORS

• • •

FABRICATED COPPER TUBE PARTS

• • •

Get our Catalog. Ask our Engineers to help in your problem.

MAIL THIS COUPON TODAY

Please rush us 32-page illustrated catalog.

Name .....

Firm Name .....

Address .....

ILSCO COPPER TUBE & PRODUCTS, Inc.
CINCINNATI, OHIO

NECA Conference Report

[FROM PAGE 189]

arate from the construction rate.

THURSDAY

The final conference session was devoted to a discussion of contractor problems and the transaction of association business.

Stating that too many contractors are willing to become labor padrones, F. W. Lord, Lord Electric Co., New York, outlined the evils resulting from direct buying by the owner. From the construction viewpoint contractors can do work more economically for the owner by furnishing the necessary materials because of (1) their knowledge of knowing where and how to buy materials for best deliveries and prices; (2) their price benefit from large purchases due to buying for multiple contracts; (3) their crediting to the job of unused materials and replacement in their own stock; and (4) the elimination of idle labor due to material delays. Citing the fixed overhead of maintenance crews, capital investment in tools and equipment and material stock, he reviewed 25 reasons why industrial electrical contractors should replace plant electricians, published in *Electrical Contracting* 13 years ago, and contended they apply just as well today. He concluded that the logical trade channel for materials and equipment is from manufacturer to wholesaler to contractor to customer.

Discussing the proper application of overhead, C. W. Moseley, R. H. Bouligny, Inc., Charlotte, N. C., recommended that all jobs be broken down into direct material cost, direct labor cost, *direct job expense* and general overhead. There are three methods of applying overhead, he continued, the direct labor cost method, the direct labor hours method, and the direct labor and materials method. A study Mr. Moseley made of a group of jobs revealed that overhead applied to labor and materials was not satisfactory; that the best method is to *apply overhead as a percentage of labor cost.* By doing this the contractor can accurately estimate the cost of jobs involving materials and labor or labor only, and we must be prepared to accept contracts for either type of job, he concluded.

Believing that customer confidence will be increased if he is assured of the experience, qualifications, integrity and honesty of the contractor, W. J. Squire, Squire Electric Co., Kansas City, Mo., recommended the registra-

DEPENDABLE CHICAGO ANCHORING UNITS HOLD!

Here's the dependable anchoring unit for use with machine bolts. Each 2-unit set consists of 4 pieces—two of malleable iron and two of lead—to insure maximum holding power. Furnished plain and threaded in 6 sizes for ⅜" to 1" bolts. With Chicago Anchoring Units, holding power equal to the tensile strength of the bolt being anchored can be obtained by using additional units.

IMMEDIATE DELIVERIES

on these and other Chicago Anchoring devices. Write for Catalog.

CHICAGO
CHICAGO EXPANSION BOLT COMPANY
2231 W. Ogden Ave. • Chicago 12, Ill.

A SPECIAL MESSAGE
About Infra-Red Ray Drying

To Those Whose Production Requirements Necessitate the Use of Lacquers, Synthetics, Paints and Other Finishes

NALCO

Use Nalco Infra-red Ray Drying Equipment to solve a wide variety of problems . . . spot drying and baking of various finishes and dopes . . . quick drying of varnishes and impregnating materials for motor windings and electrical and mechanical parts of all types.

NALCO DRITHERM LAMPS

- Will Cut drying costs and time.
- Eliminate "warm up" time.
- Require no enclosures nor ovens.
- Use a minimum of space.

Left — Nalco 5-light portable adjustable unit.

NORTH AMERICAN Electric Lamp Co.
1044 Tyler St. St. Louis 6, Missouri

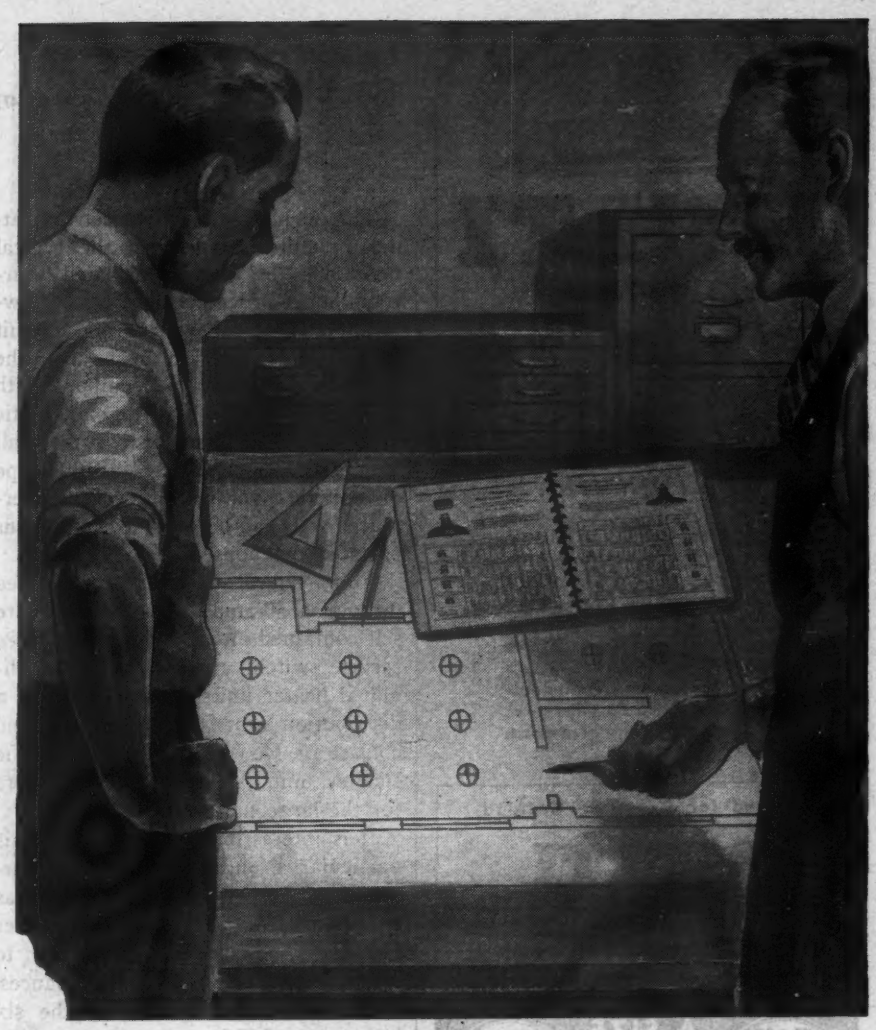
tion of electrical contractors in a paper written for the conference. Recognizing that State licensing and registration of architects and engineers has done much to raise the standards and stabilize those professions, Mr. Squire sees no reason why such registration of electrical contractors would not benefit the contractor and the electrical industry as a whole. Offering this as a suggested means of curing some of the ills of the electrical contracting industry, he urged that some action be taken to increase the stature and dignity of our profession.

In the final paper of the conference, A. Lincoln Bush, New York, reviewed the contractor's obligation to the public. We must eliminate the competitive spree, guard against lowering the standards of our business, sell the public on the economy and efficiency of contractors and support legislation for licensing and registering of contractors, he stated. Continuing, he reiterated the need for development of greater protection in the use of electricity, the sale and use of better equipment, proper labor relations, and the education of the public to the higher standards of electrical work. NECA must and will develop a policy of conduct and procedure to meet the new postwar conditions and retain the work of specialized contractors.

At the business portion of the session, six divisional vice-presidents were elected to comprise, with the president, the Administrative Committee of NECA. Those elected were: A. Lincoln Bush, New York (Div. 1); W. E. Frazer, Philadelphia (Div. 2); D. B. Clayton, Birmingham (Div. 3); J. N. Pierce, Chicago (Div. 4); Eugene Ashe, Fort Worth (Div. 5), and A. L. Stone, Los Angeles (Div. 6).

The conference adopted the Standards of the National Joint Apprenticeship Committee for the Electrical Industry as reported by Chairman Herzberg; approved the honorary membership conferred on Fred B. Adams; and approved resolutions calling for (1) the redistribution through regular trade channels of Code standard new surplus materials in original packages with the destruction of all used, salvaged and substandard new materials and the elimination of dumping of surplus materials on the market; and (2) a corporate income tax program for the transition period embodying a war tax settlement proposal, elimination of the excess profits and capital stock taxes and reduction in normal and surtaxes.

Contingent upon conditions at the time, the next annual meeting will be at Mackinac Island.



The Best Illumination is *ENGINEERED*

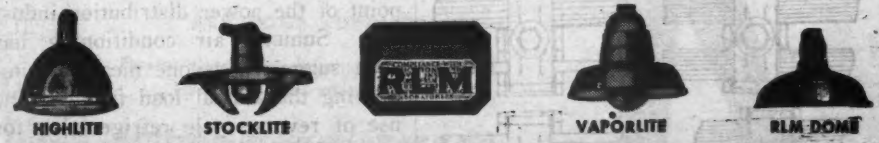
THERE'S no place for guesswork in modern industrial lighting. Every plant that needs lighting is worth lighting *correctly.*

And illumination that is properly and scientifically planned does the job correctly and costs less in the long run.

Goodrich illuminating engineers are ready to help you plan any lighting installation. They start with the basic problem—select from the hundreds of sizes and styles of equipment that which is scientifically designed for your specific job. Their experience, ranging from the simplest to the most complex lighting problem, is at your disposal—to help you provide comfortable, abundant illumination, properly engineered to your own requirements.

Yes, today illumination engineering is an exact science that will help you keep production moving, reduce errors, and improve working conditions in your plant.

Sold through electrical wholesalers



HIGHLITE STOCKLITE VAPORLITE RLM DOME

GOODRICH
ELECTRIC COMPANY
4600 BELLE PLAINE AVENUE, CHICAGO 41, ILLINOIS

MULTI

Reflectors

Good Lighting Means Higher Efficiency - - -

. . . when you install MULTI Units you are insuring high efficiency for your customers. They require little or no attention or maintenance after you install them. You can give a full guarantee on every job when you use MULTI Reflectors. They are all-time favorites with contractors and give good, long-time service.

• Send for Complete Catalog

MULTI

ELECTRICAL MANUFACTURING CO.

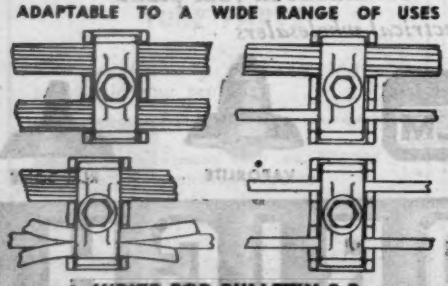
1840 W. 14TH ST., CHICAGO, ILL.

K&H Solderless Terminal LUGS — A SIZE and TYPE for every need! — K&H Solderless CONNECTORS

UNIVERSAL Tap Connector

Effectively used as guy line ground, or transformer and lightning arrester connection to A. C. S. R. or copperweld conductors where the diameters may be from 8-A copperweld to .595" A. C. S. R. armour rods. Wire sizes .595" to 5/32".

ADAPTABLE TO A WIDE RANGE OF USES



WRITE FOR BULLETIN 8-B

KRUEGER & HUDEPOHL

232-8 VINE ST • CINCINNATI 2, OHIO

Heating Small Homes Electrically

[FROM PAGE 47]

The wiring system for electric heating is quite simple. In the typical floor plan of a well insulated four-room house in Knoxville, Tenn., showing the electrical service and circuit requirements, the heaters are the radiant-convection type equipped with individual thermostats for automatic control and mounted flush in the wall structure (see photo). With this type of individual control, different temperature levels can be provided in various parts of the house—room by room.

This typical house was served through a 50-ampere, 240-volt, 3-wire self-contained meter and a 100-ampere service switch. Circuits for the individual heater units, emanating from a distribution center, are 230-volts and consist of No. 12 conductors for the smaller units and No. 10 conductors for the large units.

It is interesting to note that in this particular group of houses (4 four-room and 2 five-room) each house was equipped with an electric range, water heater and refrigerator in addition to lighting and miscellaneous appliances. The total connected load of the six houses was 162 kw., an average of 27 kw. per house. Over a two-year period the total annual current consumption for all purposes was 11,224 kwh. per house, of which 7,046 kwh. or 63 percent was for heating.

Another interesting study is that of load division on distribution transformers serving these houses. The group of six mentioned above (part of a subdivision of 52 houses all with electric heat) with a connected load of 162 kw. is being satisfactorily served by one 50-kva. transformer. The load for the 52 houses is divided among eight transformers resulting in an average of 6.96 transformer kva. per house.

There is the argument that electric house heating is a seasonal and therefore undesirable load from the standpoint of the power distribution industry. Summer air conditioning has been suggested as one means of improving the annual load factor. The use of reverse-cycle refrigeration for summer cooling and winter heating has also been suggested but this needs more study and improvement for application to the residential field. In the interim, a combination of space heaters and room cooling units may become the first step to all-year air conditioning.

A STRONGER FACTOR in TODAY'S NEW COMPLETE CIRCUIT PROTECTION

EXTRACTOR POSTS

WITH ELECTRICALLY WELDED SIDE TERMINALS

Terminals integral with inner shell mean more strength against extreme shock, vibration and temperatures. Maximum electrical conductivity. New construction for convenience and durability. Shock-proof visual inspection. Specially designed grip prevents fuse from dropping out.

Send for B/P and ENGINEERING DATA

Ask for Samples

342001 finger-operated for 3 A G fuses illustrated. Also furnished screwdriver operated meeting Underwriters' specifications.

LITTELFUSE INCORPORATED

4757 Ravenswood Ave., Chicago 40, Ill.

200 Ong St., El Monte, Calif.

ELECTRICAL SPECIALTIES

FOR HEAVY INDUSTRIAL SERVICE

FROM STOCK

RMC

Soldering Lug — 3-Conductor Angle Pothead — Single Conductor Pothead

Write for a complete selection of RUSGREEN bulletins

ENDULATORS (POTHEADS) ALL SIZES • ALL SHAPES • ALL VOLTAGES • ALL TYPES • BUS SUPPORTS • SPLICING KITS AND MATERIALS • INSULATING COMPOUNDS

★ ★ ★

RUSGREEN MFG. CO.

14260 Birwood Avenue • Detroit, Mich.

Totally Indirect Industrial Lighting

[FROM PAGE 45]

operating a 90 ampere 3 pole magnetic contactor. Each lighting circuit feeds 12 lighting units which are electrically connected in pairs. A pair consists of two units of the same type, that is either incandescent or mercury, physically located opposite each other on either side of the cat-walk. The lead wires to a pair carry through a fused safety switch, thence directly to the units in the case of incandescent fixtures, or through a two-lamp ballast and then to the reflectors in the case of the mercury fixtures. Switching control of pairs of reflectors or groups of reflectors on the cat-walk permits isolation of units for servicing. Such safety measures made possible the use of 460 volt, 3 phase, 3 wire lighting distribution circuits which in themselves are a deviation from standard practice. Normal control of the lighting system is performed through the operation of pushbuttons in the lighting panels conveniently located throughout the plant. This operation energizes pilot circuits which activate the magnetic contactors which in turn control the groups of fixtures. This group control through the magnetic contactors is so arranged that selective sections of a continuous bay may be lighted or cut out if production schedules indicate the desirability of such procedure. The distribution wires are carried in a square duct laid on the floor of one side of the cat-walk, then directly to the fused safety switches controlling the pairs of mercury and incandescent units.

The entire system is of the most modern design to assure continuity of service. A separate substation is provided to supply emergency lighting in case of failure of the normal incoming power lines.

A glazed finish porcelain enameled steel was selected for the reflector. This reflector material was second choice to specular Alzak aluminum which was unavailable at that time due to war restrictions. However, the semi-specularity of the glazed porcelain enamel gave promise of producing satisfactory results.

The reflectors for both the mercury and incandescent lamps are very similar in appearance particularly when viewed from the ground. The units are about 72 inches long, about 18 inches high and 22 inches wide. The

[Continued on page 194]

If you have ever been up on a 50-foot stick with a winter wind whistling around your ears . . . if you have ever had to work on tough-stranded cables, or heavy insulated wire under these conditions, you know how important good equipment is.

Tough jobs are the best laboratory to test the true quality of tools and equipment, and in this laboratory of actual use, Klein's have been proving their high quality "since 1857."

Men on the pole recognize the importance of quality pliers and wrenches, safety straps and belts, grips and connectors—that's why you will find so many "linemen are Kleinmen."

Since 1857

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electrical Corporation, New York

This book on the care and safe use of tools will be sent without charge upon request.

Mathias KLEIN & Sons
Established 1857
Chicago, Ill., U.S.A.
3200 BELMONT AVENUE, CHICAGO 18, ILLINOIS

You can bank on "SPOT" VENTILATORS as a postwar money maker!

Among the big electrical profit items for postwar construction will be "spot" ventilators.

No longer will home owners willingly put up with greasy cooking vapors penetrating the house. Bathroom steam, gameroom smoke and odors will not be tolerated.

Blo-Fan "SPOT VENTILATORS" will top specification lists on both new and remodel work. Blo-Fan is more than a fan—more than a blower. It's a combination of the two, capturing the foul air as it rises—*at its source*... instantly ejecting it. No other ventilator offers such effectiveness.

Check Blo-Fan as a postwar profitmaker.

WRITE TODAY FOR DETAILS

PRYNE & CO., INC.
1245 E. 33rd St. • LOS ANGELES, 54
BRANCHES TO BE RE ESTABLISHED AFTER THE WAR:
SAN FRANCISCO • SEATTLE • CHICAGO • NEW YORK

Totally Indirect Industrial Lighting [FROM PAGE 193]

mercury reflectors hold one 3000 watt lamp. The incandescent reflectors are equipped with four sockets so wired that 115 volt lamps burning in series operate directly on the 460 volt distribution system. The lamps are of the arc resisting type which are so designed that on lamp failure the arc is quenched within the bulb. The sockets are mounted on adjustable supports so that various lamp sizes can be properly positioned in the reflectors. In the high bays 751 watt lamps are used and in the low bays 501 watt lamps are used.

The reflectors are mounted on either side of the cat-walks by means of a pair of bracket arms which are attached to the main channels of the cat-walk structure. The reflectors are adjustable and the brackets are equipped with stops so that the units can be tilted back to a servicing position and returned to their original setting. A clamp type locking device is also incorporated. Along a cat-walk the pairs are alternately filament and mercury. In the low bays the spacing between units is 15 feet and in the high bays the spacing is 7½ feet.

One Year Performance Recorded

At the time the plant was taken over by the Budd Company, an engineer was given complete responsibilty for the lighting system. This engineer, with his crew, has been servicing the installation for nearly one year of operation. His records and reports provide the data which gave a clearcut picture of the performance of this lighting installation.

First of all the indirect lighting system proved to be, by far, the most economical from an initial investment standpoint. When wiring and installation costs were included, the system proved to be the cheapest on the basis of first cost. It should also be pointed out that certain changes and modifications in other features of the building which in no wise affected the indirect system, would have necessitated drastic changes in the other systems contemplated in the development stages. Such changes in Budd Field would have required drilling the concrete for the placement of inserts to support the lighting equipment. This would have meant exceedingly high costs. Because of these conditions, it was estimated that any other type of lighting system would have resulted in an initial investment many times the expenditure for the one which is installed.

The quality of illumination produced is all that could have been anticipated. To the observer, the lighting on the ceiling is quite uniform, although in the small bays, because the cat-walks are in fairly close proximity to the zenith of the arch and the light sources are on wider spacings, there is a slight variation in color from the alternate pairs of mercury and incandescent fixtures. However, this condition is not objectionable and, it may be added, is not particularly noticeable except to the critical observer. The ceiling brightness does not exceed 250 foot-lamberts. The distribution of light is excellent, producing a soft well-diffused illumination with a minimum of shadows.

When the installation was first put into service, illumination values were in the range of 45 to 50 foot-candles. Observations at the plant brought forth the realization that lower foot-candles of indirect lighting were preferable to higher foot-candles of direct lighting. This was proved in the few locations where local lighting was used. In spite of the fact that well-diffused, low brightness units were developed for the supplementary lighting, the high specularity of stainless steel surfaces made long period seeing conditions almost intolerable. Therefore it was believed that if 35 to 50 foot-candles of direct lighting was considered adequate for war production, then a somewhat lower level of totally indirect lighting would provide at least equivalent and probably better seeing conditions. Based on such information it was decided that certain sacrifices in foot-candles should be made in order to obtain desirable data and to effect additional economies in operating performance. The first step was to introduce 120 volt incandescent lamps in place of the 115 volt lamps which were originally installed. This change obtained about 50 percent longer average life for the filament sources while it also meant about 14 percent reduction in the lumen output of these sources. It should be noted, however, that the incandescent component represents only one-third of the total. Thus the loss in total lumens from this procedure was only about four percent.

The 3 k.w. mercury vapor lamp was such a recent development at the time the assembly plant was put into operation that little data on performance in the field was available. It was felt, however, that under the operating conditions on this job the 3 k.w. lamp

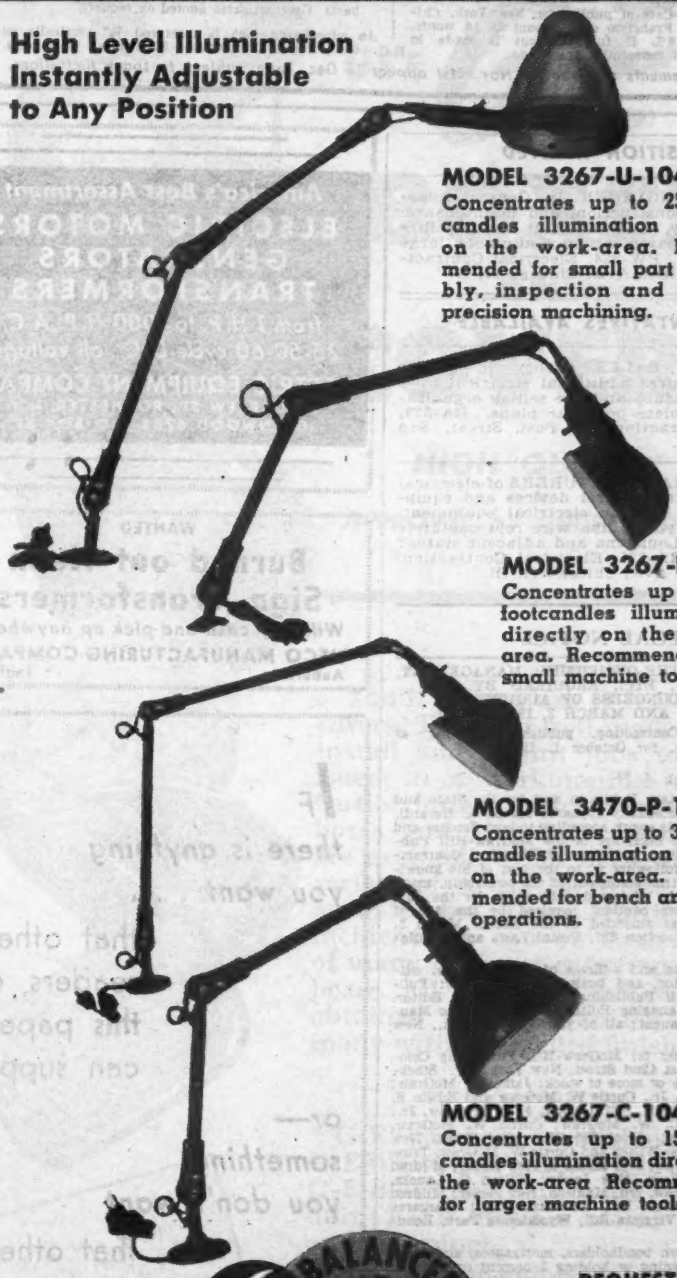
would have a life considerably in excess of its published rating of 2000 hours. It was also believed that its efficiency would be fairly satisfactory throughout most of the operating period. The only way to determine the useful life in active service was to make the second step which was the decision to keep the three k.w. lamps in operation until failure occurred. Accurate records of ten months of service show that these sources have been operating on an average of 15–18 hours daily or a total of approximately 5000 hours with only seven percent replacements for the entire period. The available data also shows that these lamps are producing about 75 percent of their initial rated lumens output after the 10 months of operation. The losses incurred in the execution of these procedures together with an estimated average depreciation of 10 percent in lumen output for the filament lamps results in a drop of approximately 23 percent in resultant illumination values. On the basis of initial utilization, with no depreciation, this would mean an expectancy of about 36 foot-candles.

Of course, there has been a depreciation from the initial efficiency of the overall system, which normally might be expected to reduce as much as 50 or 60 percent. However, the assembly operations performed in Budd Field are particularly clean. Also excellent housekeeping is required, especially in connection with the lighting system and the forethought in providing lighting cat-walks makes maintenance easy, safe and economical. Thus today the average illumination throughout the plant is approximately 30 foot-candles. This means a depreciation in utilization of about 20 percent which for an indirect lighting system, particularly in an industrial plant, is noteworthy.

FROM SPRINGFIELD, OHIO, came J. O. Helms (left) meter supt., Ohio Edison Co., and H. P. Van Tress, city electrical inspector, to attend the recent Indianapolis meeting of the Western Section, I.A.E.I.

LOCALITES
for Quick Accurate Seeing of
CRITICAL WORK TASKS

High Level Illumination
Instantly Adjustable
to Any Position



MODEL 3267-U-104
Concentrates up to 250 footcandles illumination directly on the work-area. Recommended for small part assembly, inspection and certain precision machining.

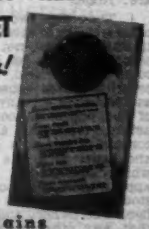
MODEL 3267-H-102
Concentrates up to 200 footcandles illumination directly on the work-area. Recommended for small machine tools.

MODEL 3470-P-104
Concentrates up to 300 footcandles illumination directly on the work-area. Recommended for bench and table operations.

MODEL 3267-C-104
Concentrates up to 150 footcandles illumination directly on the work-area Recommended for larger machine tools.

BALANCED LIGHTING
fostoria
GENERALITES for Overall Lighting • LOCALITES for Light ON the Job
Trade Mark Reg. U. S. Pat. Off

REQUEST FREE BOOKLET Today!



Explains the efficient and economical results of Balanced Lighting and how to obtain it. Ask for folder BL-3-EC

FOSTORIA INDUSTRIAL SERVICE
Factory and General Offices • Fostoria, Ohio
Affiliated Manufacturers:
Southern Industries, Inc., Atlanta
Newmac Co., Ltd., San Francisco
Amalgamated Electric Corp., Ltd., Toronto, Canada

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT : "OPPORTUNITIES" : EQUIPMENT
BUSINESS : : USED OR RESALE

UNDISPLAYED ——RATES—— DISPLAYED

(Not available for equipment advertising)

10 CENTS A WORD. MINIMUM CHARGE $2.00

Positions Wanted (full or part time individual salaried employment only), ½ the above rates payable in advance.

Box Numbers—Care of publication New York, Chicago or San Francisco offices count as 10 words.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display of advertisements.

The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page. E.C.

New advertisements received by Nov. 21st appear in Dec. issue, subject to space limitations.

POSITION WANTED

ELECTRICAL ENGINEER, 38. General industrial design, construction, and maintenance. Executive ability. Can take full responsibility of electrical department of medium or large industrial plant. PW-324, Electrical Contracting, 520 N. Michigan Ave., Chicago 11, Ill.

REPRESENTATIVES AVAILABLE

ESTABLISHED SALES agency in Pacific Northwest desires additional electrical lines have own warehouse and live selling organization. Give complete post-war plans. RA-323, Electrical Contracting, 68 Post Street, San Francisco 4, Cal.

ATTENTION: MANUFACTURERS of electrical wiring material, control devices and equipment including aviation electrical equipment. Do you want a young live wire representative in the state of Louisiana and adjacent states? If so, address RA-325, Electrical Contracting, 520 N. Michigan Ave., Chicago 11, Ill.

LEGAL NOTICE

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of Electrical Contracting, published Monthly at Albany, New York, for October 1, 1944.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared Joseph A. Gerardi, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Electrical Contracting, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to wit:

1. That the name and address of the publisher, editor, managing editor, and business managers is: Publisher, McGraw-Hill Publishing Company, Inc.; Editor, W. T. Stewart; Managing Editor, None. Business Manager, M. S. MacNaught; all of 330 West 42nd St., New York City 18.

2. That the owner is: McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York City. Stockholders holding 1% or more of stock: James H. McGraw; James H. McGraw, Jr., Curtis W. McGraw and Edwin S. Wilsey, Trustees for: H. W. McGraw, J. H. McGraw, Jr., D. C. McGraw, C. W. McGraw; Curtis W. McGraw, Donald C. McGraw; all of 330 West 42nd Street, New York City; Edwin S. Wilsey and Curtis W. McGraw, Trustees for J. H. McGraw, 3rd, Madison, New Jersey; Mildred W. McGraw, Madison, New Jersey; Wilson C. Lauckx, tees for J. H. McGraw, 3rd, Madison, New Jersey; Mildred 78 No. Country Club Dr., Phoenix, Ariz.; Margaret Stump, 1418 Rose Virginia Rd., Wyomissing Park, Reading, Pa.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

J. A. GERARDI, Secretary.

McGRAW-HILL PUBLISHING COMPANY, INC.

Sworn to and subscribed before me this 28th day of September, 1944.

[SEAL] ELVA G. MASLIN.

(My commission expires March 30, 1946.)

America's Best Assortment
ELECTRIC MOTORS
GENERATORS
TRANSFORMERS
from 1 H.P. to 1000 H.P. A.C.
25-50-60 cycle D.C., all voltages
ELECTRIC EQUIPMENT COMPANY
63 CURLEW ST., ROCHESTER, N.Y.
GLENWOOD 6783, P.O. BOX 51

WANTED
Burned out Neon Sign Transformers
Will pay cash and pick up anywhere.
NECO MANUFACTURING COMPANY
Auburn Indiana

IF there is anything you want . . .
that other readers of this paper can supply
or—
something you don't want
that other readers can use, advertise it in the
SEARCHLIGHT SECTION

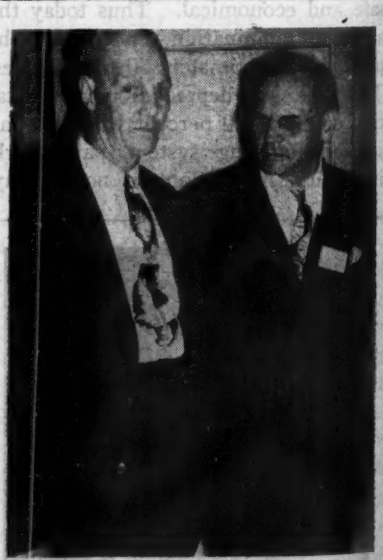
Pole for Relamping Fluorescents

[FROM PAGE 48]

starter end is merely a clamping mechanism that, by remote control, allows the changing of the starter by a simple clamp and twist motion.

The tube end of the pole is similar but somewhat more complex, in that the mechanism incorporates the full 90° turn necessary to lock the tube in its permanent location in the fixture after insertion.

Items that are suggested as the result of our experience is to first of all make sure that the tube is placed in the pole clamp with its two prongs of tube contact in a vertical line parallel to the length of the pole so that the tube will readily clear into the fixture sockets upon insertion. The main stem of the pole is kept vertical at all times. After insertion, the pole is merely carried to the right or left as the case may be (with pole still maintained in a vertical position), the twist being automatically performed to an exact 90 degrees by the pivoting arm on the end which holds the tube clamp. Assurance can be had against the tube slipping during the twist by placing the tube in the clamp with the trade mark stamp in such a position, that after the tube has been properly locked into the fixture, the manufacturer's stamp will appear directly down giving the maintenance man a definite visual check that the tube is in proper locked position in the sockets.



CORNER CONFAB at recent Western Section, I.A.E.I. conference in Indianapolis finds A. E. Holmes (left) American Metal Holding Company, Chicago; and James Gailbraith (retired chief electrical inspector of Detroit) now with Bull Dog Electric Products Co., Detroit, discussing mutual problems.

[FROM PAGE 126]

(2) *Industrial Installations*—10 to 12 percent, depending upon the type of equipment. (Here obsolesence is less rapid from the appearance standpoint).

(3) *Add for Taxes, Interest and Insurance*—an additional 10 percent of the initial investment.

b. *Fixture (Luminaire) Costs*—allowances per year similar to those for wiring should be used for fixture investment. For fluorescent and high intensity mercury lighting, auxiliary equipment costs should be included—if not a part of the original cost of fixtures.

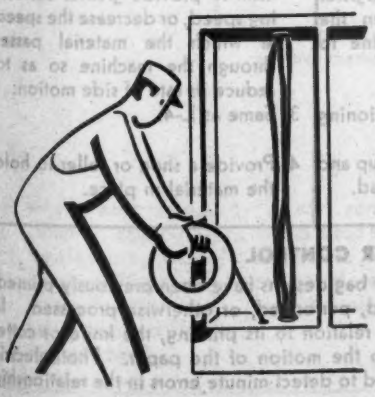
II. OPERATING CHARGES—

a. *Cost of Lamps*—net lamp cost should always be used with a prorata allowance for hours of operation as compared with average rated life.

b. *Cost of Electrical Energy*—exact energy costs can be determined based upon the hours of operation and cost per kilowatt hour. Include wattage consumed by auxiliaries in fluorescent and high intensity mercury lighting installations.

c. *Maintenance Cost*—this charge includes necessary labor and materials for relamping, cleaning, and repairing lighting equipment, as well as other costs incident to the proper maintenance of the lighting system.

Comparative Analyses of two or more types of lighting systems is an accepted method of determining the most economical system to recommend for a specific installation. In preparing an analysis of this type, it is important to remember that *all costs must be figured on the basis of equal illumination levels and comparable quality of lighting.* The accompanying chart is an example of the method commonly employed in analyzing costs.



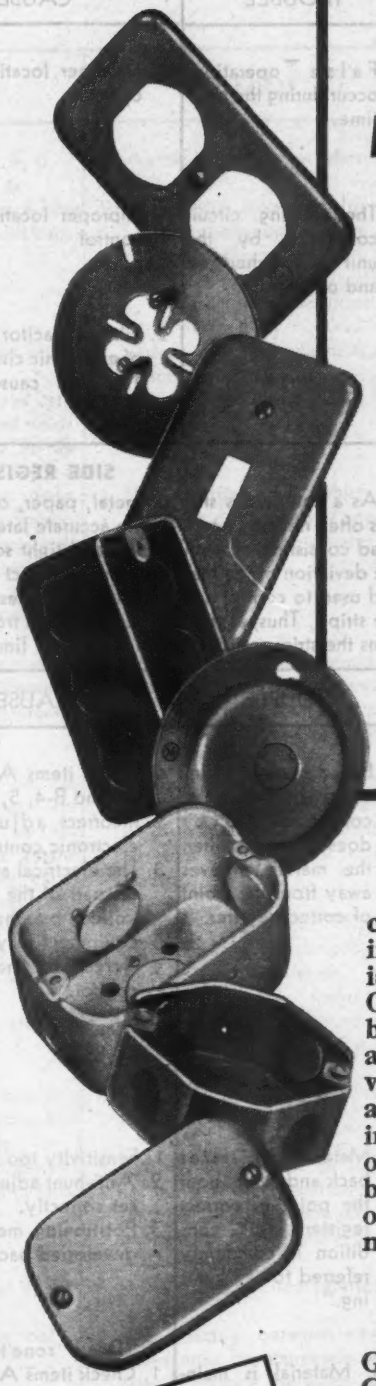
For New Wiring, Rewiring and Maintenance Wiring

USE G-E BOXES AND COVERS

HIGH QUALITY

★

APPROVED BY UNDERWRITERS'



You'll like to use G-E boxes and covers. They are well made, easy to install and permit jobs to be finished in a workmanlike manner. Outlet boxes, switch boxes, utility boxes and Multilet conduit boxes are available in all needed sizes. A variety of covers for these boxes is available too. Three Multilet boxes, incidentally, can be used in place of many different cast iron conduit boxes. All boxes and covers may be obtained with galvanized finish—many with enamelled finish.

CONDUITS

G-E conduits available include G-E White zinc coated rigid conduit, G-E Black enamel coated rigid conduit, EMT, flexible metal conduit and Fiberduct.

For further information see the nearest G-E Merchandise Distributor or write to Section C1141-8, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

Hear the General Electric radio programs: "The G-E All Girl Orchestra" Sunday 10 P.M. EWT, NBC. "The World Today" news every weekday 6:45 P.M. EWT, CBS.

★ ★ ★

BUY WAR BONDS

GENERAL ELECTRIC

WHERE TO BUY

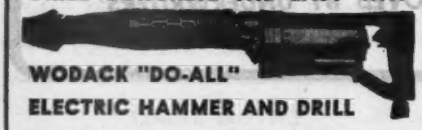
Equipment, Materials and Supplies for Electrical Construction — Maintenance—Repairs

TORK

TURN ANYTHING ELECTRICAL ON & OFF REGULARLY

The TORK CLOCK CO., Inc.
MOUNT VERNON, NEW YORK

DRILL CONCRETE THE EASY WAY

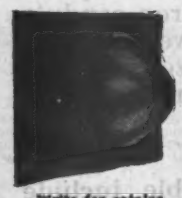


WODACK "DO-ALL"
ELECTRIC HAMMER AND DRILL

Saves time and labor installing expansion anchors. Two motions—reciprocal for hammer drilling—rotary for twist drilling. Drills masonry to 1⅝" dia., metal ⅝". Easy to maintain. Universal motor, runs direct from lamp socket. Weighs 15 lbs. Star drills in 17 diameters. Also chisels, bull points, etc. Ask for bulletin.

Wodack Electric Tool Corporation
4628 W. Huron St. Chicago 44, Ill.
Telephone AUstin 9866

SWITCHPLATE LAMP



An Ideal Over Door Signal . . .

A real lamp in a switchplate. Mounts on a single-gang box. Ideal for scores of applications where a modest light is adequate. Low current consumption. Perfect for "over door" signal; to mark equipment; for elevator up-down signals; etc. Uses either 3 or 6 watt MC—120 volt tungsten lamp. 2" lens diameter. Colors, red-green-white.

Write for catalog on other types

Sold Nationally by
THE GRAYBAR ELECTRIC CO.
Mfg'd by the H. R. Kirkland Co., Morristown, N. J.

for
ALLEN
SAFETY'S SAKE
SODER-FLUX
Underwriters' Approved
L. B. ALLEN CO., INC.
6715 Bryn Mawr Ave. Chicago 31, Ill.

ELECTRIC HEATING APPLIANCE ELEMENTS REPAIRED. NICHROCITE PASTE IS USED.

To get at otherwise inaccessible places, in toasters, irons, overhead elements in ovens, furnaces, etc. Simply overlap ends apply Nichrocite Paste and turn on current. Used by large utility companies. Generous trial order $1.00, 4 oz., $2.50, 1 pound $8.00.

ADVANCE CO. Box 861 Minneapolis, Minn.

Electronics

[Continued on page 136]

TROUBLE	CAUSE	REMEDY
I. False operations occur during the daytime.	1. Improper location of light control.	1. Control must be mounted high enough and away from moving objects in order to prevent temporary shadows from being cast on phototube, thereby causing false operations.
J. The lighting circuit controlled by the unit is switched on and off rapidly.	1. Improper location of light control.	1. This condition may be caused by the controlled lights shining on the phototube. Change location of control unit so this does not occur.
	2. Filter capacitor in rectifier of electronic circuit is open. This will cause relay to chatter.	2. Replace filter capacitor.

SIDE REGISTER CONTROL

As a continuous strip of metal, paper, or cloth is fed through a machine for processing it is often necessary to maintain accurate lateral alignment of the material edge. A scanning head consisting of a phototube and light source develops an electrical signal indicative of the deviation of the material from its correct position. This signal is amplified electronically and used to control a motor which operates a mechanism for providing lateral movement of the strip. Thus, as the strip tends to shift from side to side, the restoring signal always maintains the strip position within very close limits.

TROUBLE	CAUSE	REMEDY
K. Entire control is inoperative, that is, the correction motor does not run when the material moves away from the point of correct register.	1. Check items A-3, 4, 6, 7, 10 and B-4, 5, 6.	1. As indicated in item referred to.
	2. Incorrect adjustment of electronic control.	2. Adjust control in accordance with manufacturer's instructions.
	3. The electrical and mechanical part of the system controlled by the electronic equipment may be at fault.	3. Inspect all motors, generators, pushbutton stations, contactors, mechanical drives, etc., and make any necessary repairs.
	4. Defect in the electronic control.	4. By means of a cathode ray oscilloscope or other suitable instrument, try to determine the general location of the trouble, that is, whether it is in the scanning head, control panel, or other auxiliary control. Refer to article for service instructions.
L. Material oscillates back and forth about the point of correct register. This condition is commonly referred to as "hunting."	1. Sensitivity too high.	1. Reduce sensitivity.
	2. Anti-hunt adjustment is not set correctly.	2. Adjust per manufacturer's instructions.
	3. Positioning mechanism has developed backlash.	3. Such factors as loose mechanical linkages, play in gears, and loose couplings will produce hunting and reduce the accuracy which can be maintained.
	4. "Dead" zone too narrow.	4. Increase width of "dead" zone.
M. Material is maintained in approximate register, but is not being held to the accuracy which has previously been obtained.	1. Check items A-2, 3, 7, 10, and B-5, 6.	1. As indicated in item referred to.
	2. Rate at which material deviates from correct register may be greater than the ability of the machine to correct.	2. Change the positioning mechanism to provide greater correcting speed, or decrease the speed at which the material passes through the machine so as to reduce its rate of side motion.
	3. Backlash in positioning mechanism.	3. Same as L-4.
	4. Material is fluttering up and down at scanning head.	4. Provide a shoe or roller to hold the material in place.

CUTOFF REGISTER CONTROL

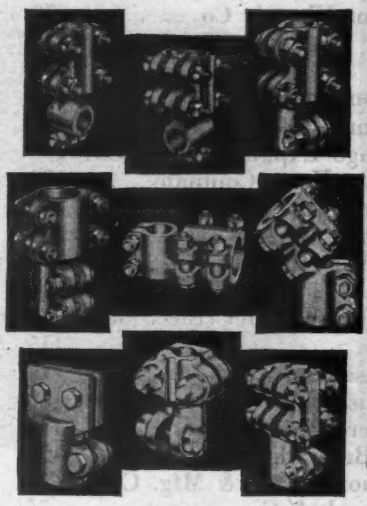
In many processes, paper, on which wrapper or bag designs have been previously printed, passes through a machine where it is cut, folded, perforated, or otherwise processed. In order to have the wrapper or bag cut in proper relation to its printing, the knife or cutter must be accurately synchronized with respect to the motion of the paper. Photoelectric equipment when applied to these machines is used to detect minute errors in the relationship

between the cutter and the paper feed, and to supply a correcting signal to a mechanical device which makes the necessary correction. The signal for determining the error is obtained photoelectrically from register marks printed on the paper in a definite relationship to the wrapper or bag design.

TROUBLE	CAUSE	REMEDY
N. The equipment does not correct for errors in register.	1. Check items A-2, 4, 6, 7, 10, and B-3, 4, 5, 6.	1. As indicated in item referred to.
	2. Register marks do not have sufficient contrast with background.	2. (a) Provide greater color contrast between register mark and background. (b) Try a blue sensitive phototube if the red sensitive tube is being used.
O. Material is being corrected by the control, but the correction does not seem to be adequate. It is continually going out of register in one direction.	1. Incorrect adjustment of the electronic control.	1. Adjust per manufacturer's instructions.
	2. Contactors or relays providing the space and velocity correction, may be defective.	2. Repair or readjust.
	3. Incorrect change gears. This causes correction motor to have either a maximum or minimum base speed and thus the motor is able to provide correction in one direction only.	3. Use change gears which will provide a paper feed of approximately 1 per cent greater than the length of cut.
	4. Gear ratio between correcting motor and differential or other correcting mechanism is not correct.	4. Correcting motor should be geared to provide between 2 and 3 per cent change in paper feed for variation in motor speed from zero to maximum.
	5. Excessive tension on material. This causes abnormal slippage in the feed rolls which is greater than the correcting capabilities of the machine.	5. Reduce tension. For best operation tension on material should be maintained substantially constant regardless of roll diameter.
P. Material is continuously being alternately advanced and retarded about the point of correct register.	1. "Dead" zone of rotary selector switch is too narrow.	1. Widen "dead" zone. Refer to manufacturer's instructions.
	2. Too much space correction is being applied.	2. Reduce space correction. Refer to manufacturer's instructions.
	3. Register marks are not spaced accurately.	3. The printing cylinder must be provided with accurately spaced register marks.
	4. Paper underneath scanning head may be fluttering and causing false signals.	4. Provide a shoe to hold paper flat at this point.
	5. Printing adjacent to register marks may be causing false signals.	5. Register marks must be located so there is a separation of at least 2 inches between the marks and any printing in line with them.
Q. Material is maintained to approximate register but is not being held to the accuracy which the machine is capable of holding.	1. Check items A-2, 7, 10 and B-3, 5, 6.	1. As indicated in item referred to.
	2. Register marks are not spaced accurately.	2. The spacing between register marks must be extremely accurate. Distance between marks must not vary more than 1/5 of the total accuracy which it is desired to maintain.
	3. Insufficient number of register marks.	3. If machine and electronic control are capable of providing good accuracy, then improved results will be obtained as the spacing between marks is decreased. A space of about 2 to 4 inches is practical.
R. In two-way register control employing contactors, both thyratrons fire simultaneously when signal is received from scanning head.	1. "Dead" zone of selector switch is too narrow, causing contacts to both thyratrons to be closed when corrective signal is received.	1. Widen "dead" zone by adjusting selector switch contacts in accordance with instructions.

"You select EXACTLY what you need— — from the COMPLETE line"

Stud Connectors and Solderless Terminal Adapters for distribution and power transformers . . . for connecting to cable, pipe or bus bar . . . in line or at any angle. Connectors with reversible clamping caps take two different ranges of cable sizes. Furnished for any number of conductors. A few of Penn-Union's many types:



Also . . . the most complete line of Service Connectors, Cable Taps, Tees . . . Straight and Parallel Connectors . . . Bus Supports, Spacers . . . Grounding Clamps, Terminal Lugs, etc. etc.

Penn-Union conductor fittings are the first choice of leading utilities, industrials, electrical manufacturers and contractors—because they have found that *"Penn-Union" on a fitting is their best guarantee of Dependability.* Write for Catalog.

PENN-UNION ELECTRIC CORPORATION
ERIE, PA. *Sold by Leading Jobbers*

PENN-UNION
Conductor Fittings

Alphabetical Index to Advertisers

★ These companies have included Briefalogs, containing additional buying information on their products, in the 1944 Edition of the Electrical Buyers' Reference.

Your Team-Mate...the Square D Field Engineer

The Square D Field Engineer is no stranger to you. He has worked with you many times on problems of electrical control or distribution. But there has never been a time when he could be as helpful as right now.

We're on the threshold of major reconversion. Thousands of electrical distribution and control systems have taken a terrific beating during these all-out production years. There's a tremendous replacement job to be done.

The more electrical efficiency your industrial customers can build into their plants right now, the better equipped they'll be to meet the highly competitive days ahead.

Let your Square D Field Engineer work with you in arriving at the right answer to any problem in electrical distribution or control. His experience is a valuable commodity these days... and backing him up in every Square D plant, are seasoned design and engineering specialists with complete and modern research and testing laboratories at their command.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

FLAMENOL* BUILDING WIRE

(Small Diameter—Thermo-plastic Insulated)

For Complete Wiring Systems

Type SN

FOR DRY LOCATIONS

Type SNW

FOR WET LOCATIONS

Approved by the Underwriters'

Flamenol Building Wire can be used for feeders, branch circuits and for special wiring of all sorts. This thermo-plastic insulated small diameter wire is available in sizes 14 to 1,000,000 CM. Type SN Flamenol wire is ideal for dry locations. Type SNW Flamenol wire is ideal for wet locations.

Flamenol Building Wire is easy to handle because of its small diameter, its comparative light weight and its smooth, hard finish. It can be stripped and spliced quickly. Wire pulling is easy.

The insulation of this wire is practically ageless, has high dielectric and mechanical strength, is flame retarding and is resistant to oils, acids and alkalies. In addition, Type SNW Flamenol wire insulation has low moisture absorption.

FOR FURTHER INFORMATION about Flamenol Building Wire or about G-E conduits or wiring devices, see the nearest G-E Merchandise Distributor or write to Section CDW1141-8, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

BUY WAR BONDS AND KEEP THEM

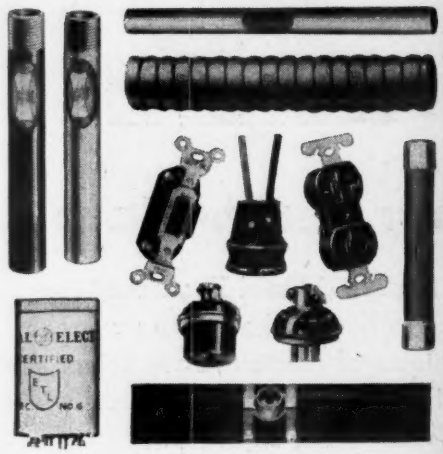
Hear the General Electric radio programs: "The G-E All Girl Orchestra" Sunday 10 P.M. EWT, NBC. "The World Today" news every weekday 6:45 P.M. EWT, CBS.

*Reg. U.S. Pat. Off.

GENERAL ELECTRIC

G-E CONDUITS AND WIRING DEVICES

General Electric also offers for your wiring needs: G-E White hot-dipped galvanized conduit and G-E Black enamelled conduit, EMT, flexible metal conduit, Fiberduct and hundreds of switches, lampholders, outlets, fuses, etc.



GREATER USE OF ELECTRICITY

Laurence W. Davis, general manager of NECA, Washington, D. C. says, "Adequate wiring is the essential key to unlocking the Home of Tomorrow. The post-war period will bring many advances in our living standards. Most of these advances will call for the greater use of electricity."

ADEQUATE WIRING SERVES AND SAVES

THE KEY TO THE HOME OF TOMORROW